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Czajkowski

(10) **Patent No.: US 9,485,229 B2**
(45) **Date of Patent: Nov. 1, 2016**

(54) **OBJECT LEVEL ENCRYPTION SYSTEM INCLUDING ENCRYPTION KEY MANAGEMENT SYSTEM**

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(73) Assignee: **Space Micro, Inc.**, San Diego, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 5 days.

(21) Appl. No.: **14/551,081**

(22) Filed: **Nov. 24, 2014**

(65) **Prior Publication Data**

US 2015/0200919 A1 Jul. 16, 2015

Related U.S. Application Data

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(51) **Int. Cl.**
H04L 9/32 (2006.01)
H04L 29/06 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 63/0435*** (2013.01); ***H04L 63/061*** (2013.01); ***H04L 63/0892*** (2013.01)

(58) **Field of Classification Search**
CPC H04L 9/08; H04L 63/061
USPC 713/171
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0191959 A1* 7/2010 Czajkowski G06F 21/14 713/155

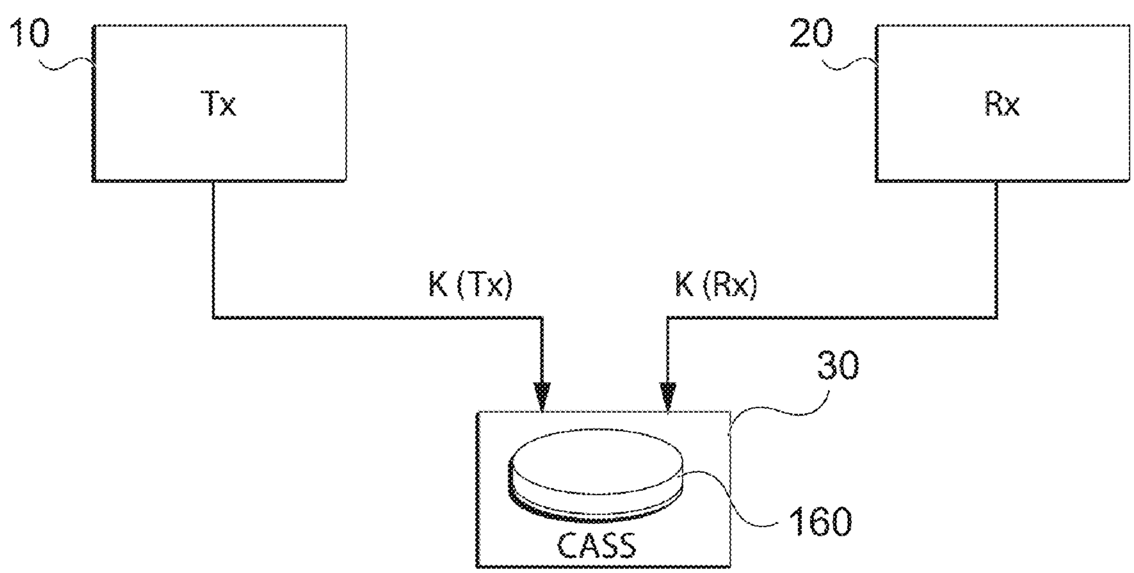
* cited by examiner

Primary Examiner — Anthony Brown
(74) *Attorney, Agent, or Firm* — Continuum Law; Robert P. Cogan

(57) **ABSTRACT**

A symmetric PGP encrypted communications path is provided in which the recipient may be identified with only publicly available information. Data to be encrypted is encrypted at the object level. Encryption keys for both the transmitter and receiver are sent to a security server. Data received from the transmitter includes intended receiver ID. The receiver includes its actual ID. The received ID and the actual ID are sent to the security server for authentication. If authentication succeeds, the security server sends a session key to the receiver, and the receiver can use its own key to decrypt data. The system reacts to authentication failure by disabling decryption in the receiver and may also take countermeasures.

12 Claims, 21 Drawing Sheets



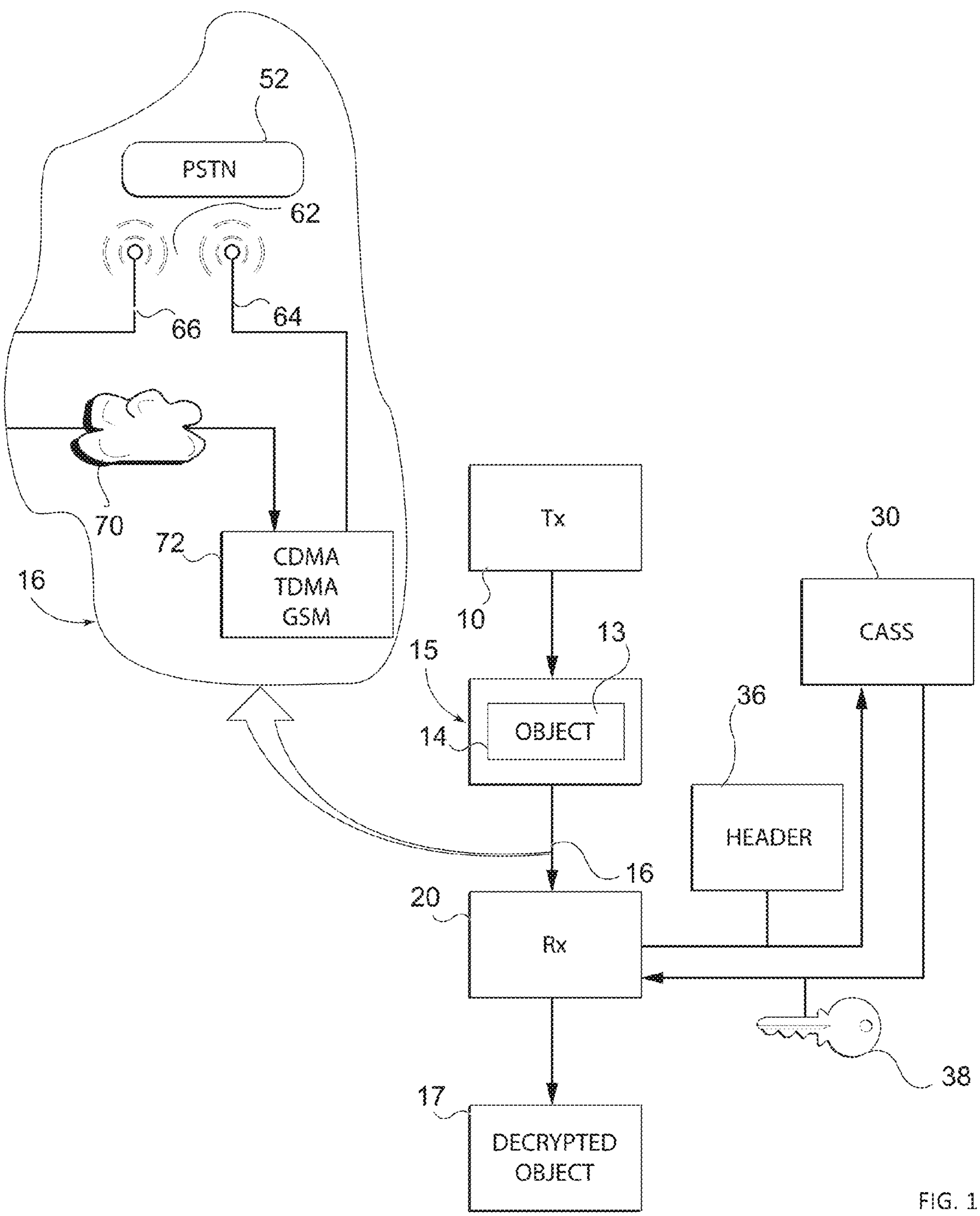

52
PSTN
62
66
64
70
72
CDMA
TDMA
GSM
16
Tx
10
30
CASS
13
15
OBJECT
14
36
HEADER
16
20
Rx
38
17
DECRYPTED
OBJECT

FIG. 1

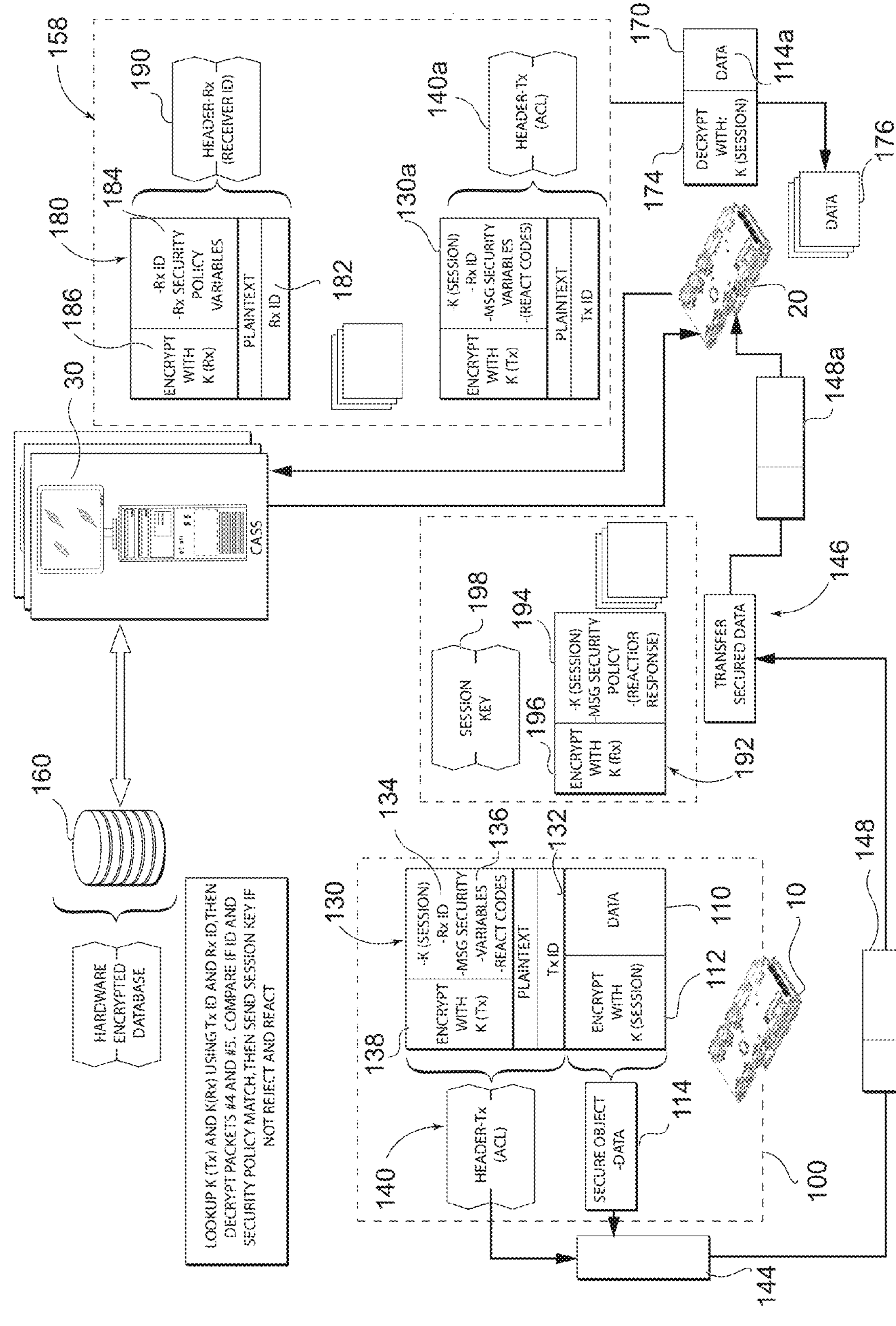

158
190
HEADER-Rx (RECEIVER ID)
184
180
-Rx ID -Rx SECURITY POLICY VARIABLES
ENCRYPT WITH K (Rx)
PLAINTEXT
Rx ID
186
182
30
140a
HEADER-Tx (ACL)
130a
-K (SESSION) -Rx ID -MSG SECURITY VARIABLES -(REACT CODES)
ENCRYPT WITH K (Tx)
PLAINTEXT
Tx ID
170
DATA
114a
DECRYPT WITH: K (SESSION)
174
176
DATA
20
148a
CASS
146
TRANSFER SECURED DATA
198
SESSION KEY
194
-K (SESSION) -MSG SECURITY POLICY -(REACTION RESPONSE)
196
ENCRYPT WITH K (Rx)
192
160
HARDWARE ENCRYPTED DATABASE
LOOKUP K (Tx) AND K(Rx) USING Tx ID AND Rx ID,THEN DECRYPT PACKETS #4 AND #5. COMPARE IF ID AND SECURITY POLICY MATCH,THEN SEND SESSION KEY IF NOT REJECT AND REACT
134
136
132
130
-K (SESSION) -Rx ID -MSG SECURITY -VARIABLES -REACT CODES
ENCRYPT WITH K (Tx)
PLAINTEXT
Tx ID
DATA
ENCRYPT WITH K (SESSION)
110
112
10
138
148
140
HEADER-Tx (ACL)
SECURE OBJECT -DATA
114
100
144

FIG. 2

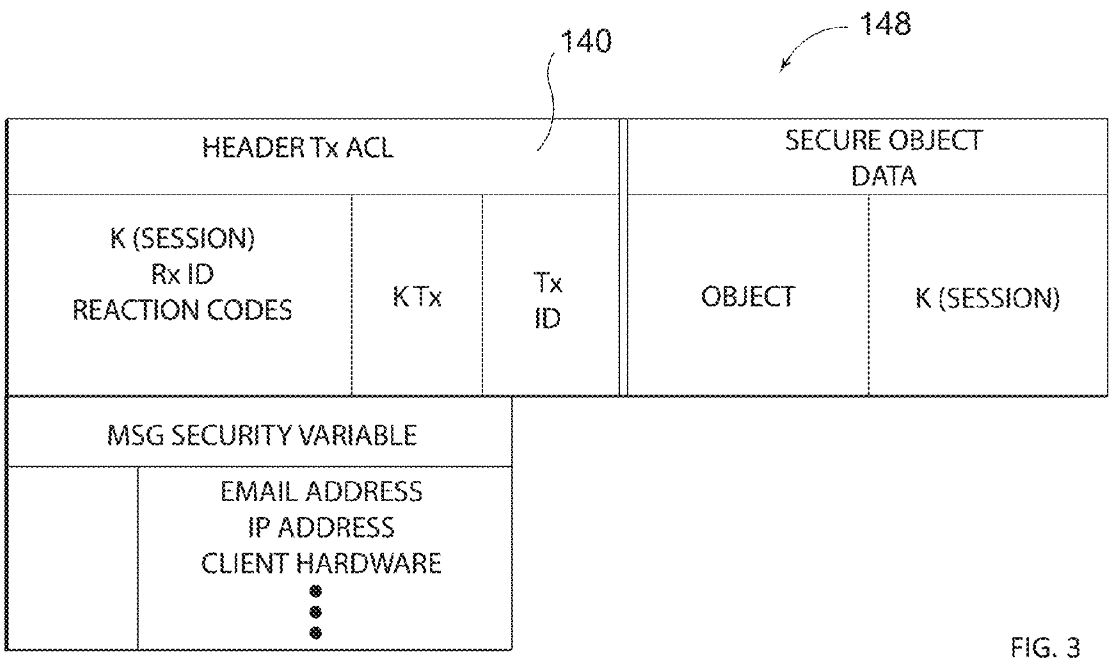

140
148
HEADER Tx ACL
K (SESSION)
Rx ID
REACTION CODES
K Tx
Tx
ID
SECURE OBJECT
DATA
OBJECT
K (SESSION)
MSG SECURITY VARIABLE
EMAIL ADDRESS
IP ADDRESS
CLIENT HARDWARE

FIG. 3

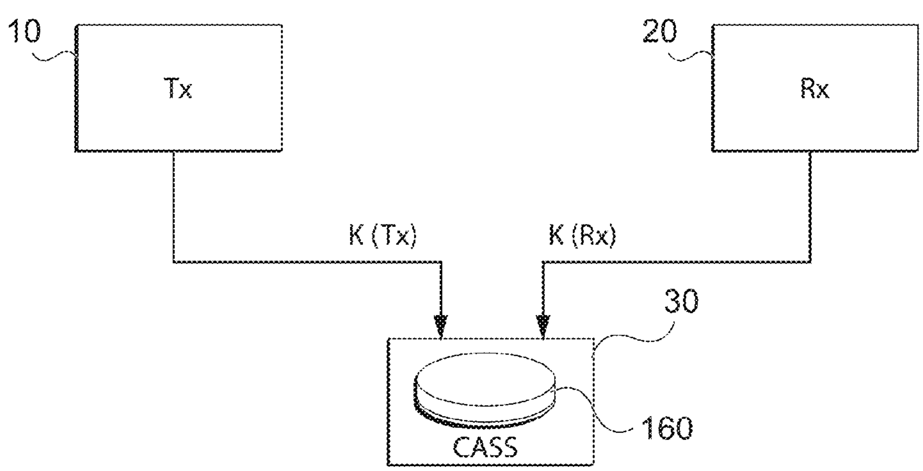

10
Tx
20
Rx
K (Tx)
K (Rx)
30
160
CASS

FIG. 4

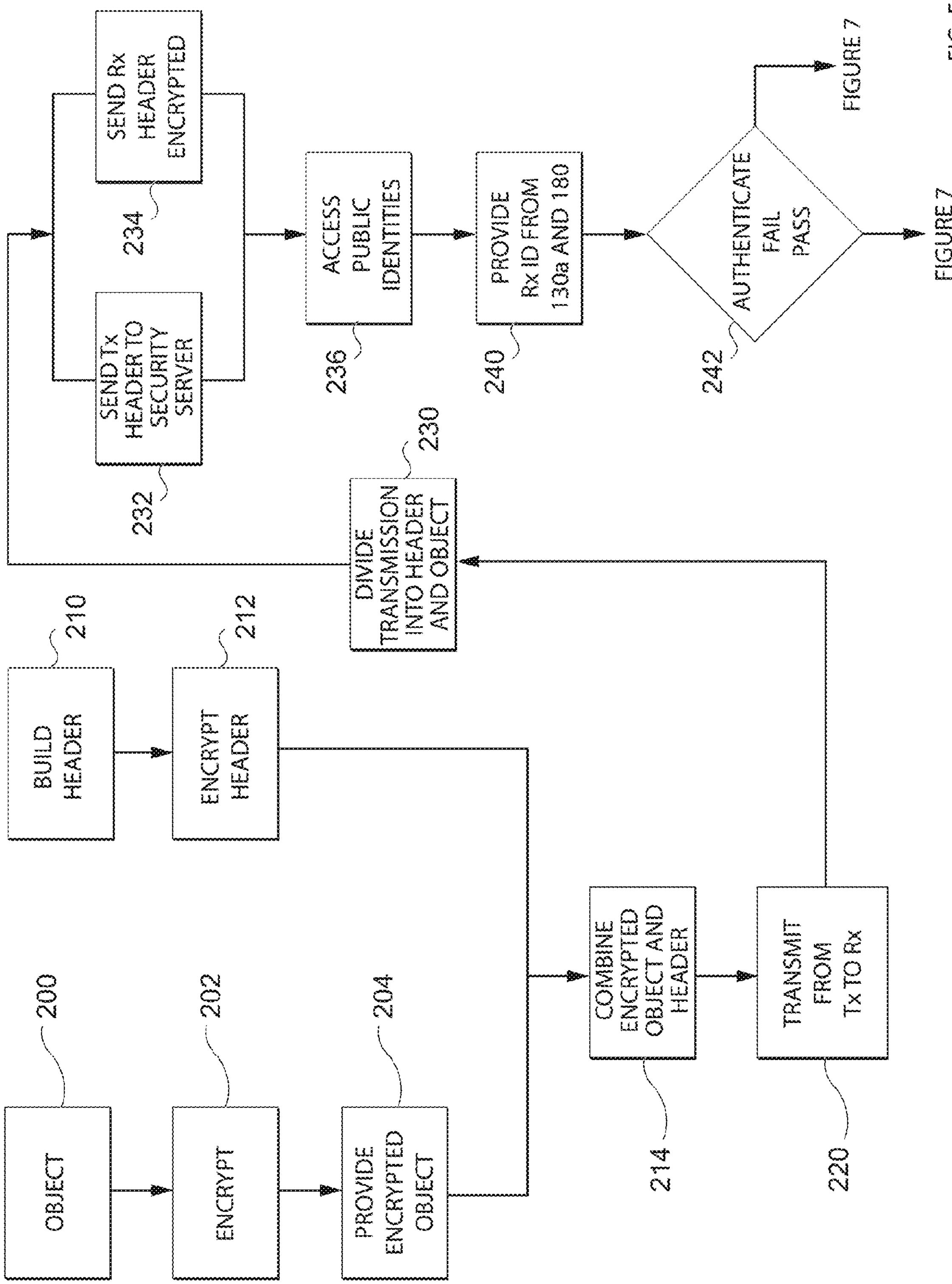

OBJECT
200
ENCRYPT
202
PROVIDE ENCRYPTED OBJECT
204
BUILD HEADER
210
ENCRYPT HEADER
212
COMBINE ENCRYPTED OBJECT AND HEADER
214
TRANSMIT FROM Tx TO Rx
220
DIVIDE TRANSMISSION INTO HEADER AND OBJECT
230
SEND Tx HEADER TO SECURITY SERVER
232
SEND Rx HEADER ENCRYPTED
234
ACCESS PUBLIC IDENTITIES
236
PROVIDE Rx ID FROM 130a AND 180
240
AUTHENTICATE FAIL PASS
242
FIGURE 7
FIGURE 7

FIG. 5

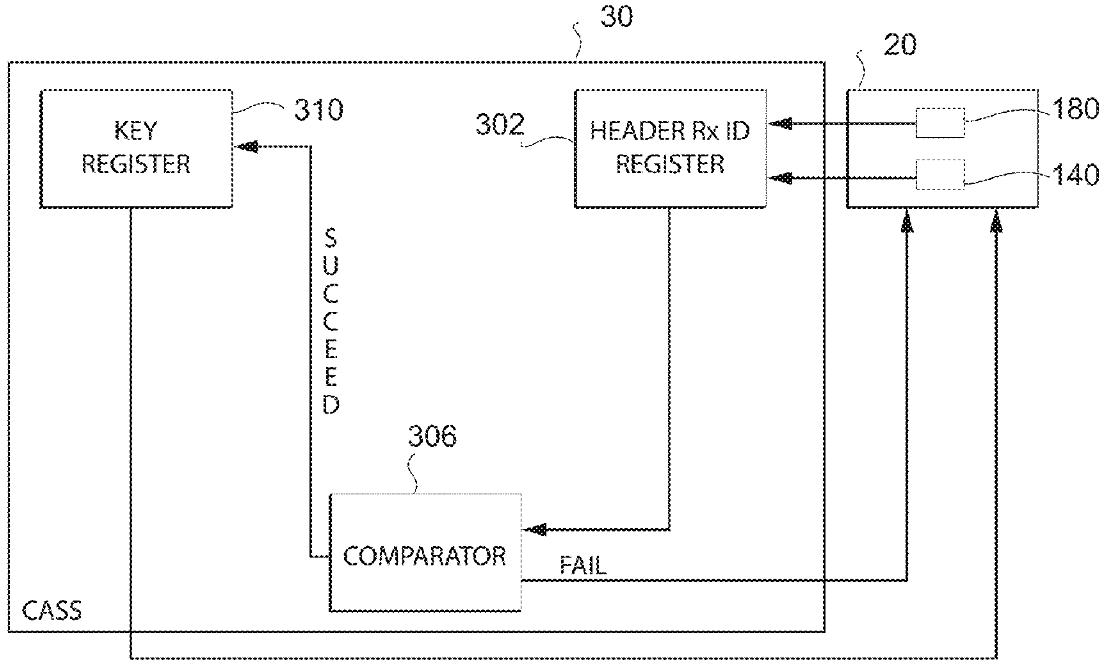

30
20
KEY
REGISTER
310
302
HEADER Rx ID
REGISTER
180
140
SUCCEED
306
COMPARATOR
FAIL
CASS

FIG. 6

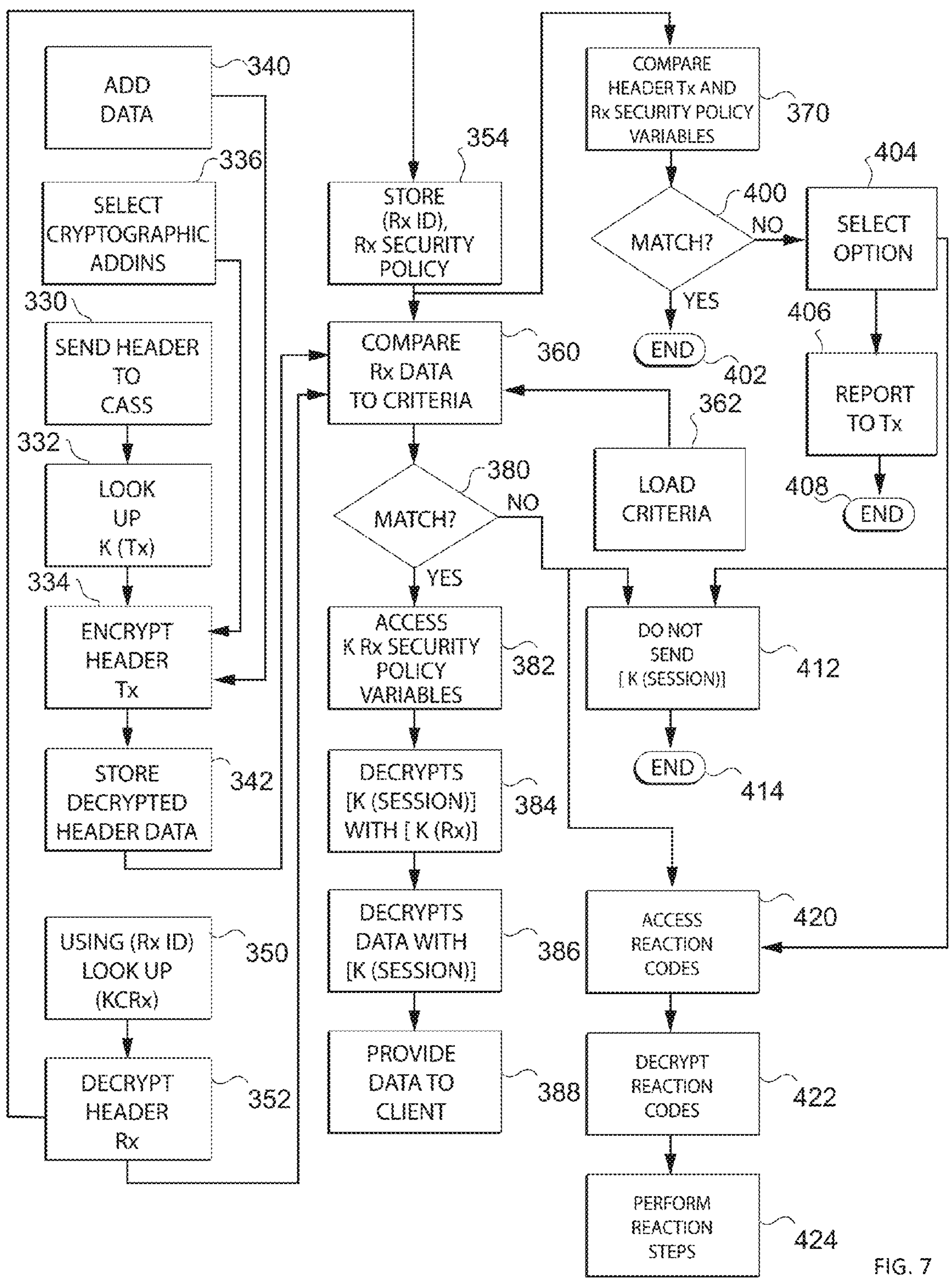

ADD DATA
340
SELECT CRYPTOGRAPHIC ADDINS
336
SEND HEADER TO CASS
330
LOOK UP K (Tx)
332
ENCRYPT HEADER Tx
334
STORE DECRYPTED HEADER DATA
342
USING (Rx ID) LOOK UP (KCRx)
350
DECRYPT HEADER Rx
352
STORE (Rx ID), Rx SECURITY POLICY
354
COMPARE Rx DATA TO CRITERIA
360
LOAD CRITERIA
362
MATCH?
380
NO
YES
ACCESS K Rx SECURITY POLICY VARIABLES
382
DECRYPTS [K (SESSION)] WITH [K (Rx)]
384
DECRYPTS DATA WITH [K (SESSION)]
386
PROVIDE DATA TO CLIENT
388
COMPARE HEADER Tx AND Rx SECURITY POLICY VARIABLES
370
MATCH?
400
NO
YES
END
402
SELECT OPTION
404
REPORT TO Tx
406
END
408
DO NOT SEND [K (SESSION)]
412
END
414
ACCESS REACTION CODES
420
DECRYPT REACTION CODES
422
PERFORM REACTION STEPS
424

FIG. 7

502

504

MSG_V	MESSAGE NUMBER
$ATCH_V$	MESSAGE ATTACHMENT NUMBER
$HWID_N$	HARDWARE ID NUMBER (COULD BE SERIAL NUMBER, PHONE NUMBER, SIM CARD, UNIQUE TO HW, ETC)
CLEARANCE	CLEARANCE LEVEL REQUIRED TO READ MESSAGE (MILITARY EXAMPLE: SECRET, TOP SECRET, SCI, ETC.; COULD HAVE COMMERCIAL EQUIVALENT)

500

BIO_D	BIOMETRIC DATA OF THE SENDER-DEVELOPER
$PASS_D$	PASSWORD SUBMITTED BY SENDER-DEVELOPER
$GUID_{ADM}$	GLOBALLY-UNIQUE ID OF THE ADMINISTRATOR
BIO_{ADM}	BIOMETRIC DATA OF THE ADM
$PASS_{ADM}$	PASSWORD SUBMITTED BY AD
SW_{ST}	SOFTWARE ID NUMBER
SW_T	SOFTWARE TITLE
SW_{ATH}	SOFTWARE AUTHOR
SW_V	SOFTWARE VERSION NUMBER
BIO_R	BIOMETRIC DATA OF THE RECE
$PASS_R$	PASSWORD SUBMITTED BY RE
$GUID_R$	GLOBALLY-UNIQUE ID OF THE
CPU_D	GLOBALLY-UNIQUE ID OF THE DEVELOPER'S CPU
CPU_{ADM}	GLOBALLY-UNIQUE ID OF THE ADMINISTRATOR'S C
CPU_R	GLOBALLY-UNIQUE ID OF THE RECEIVERS"S C
$GUID_{GR1}$	GROUP ID OF THE ADMINISTRATOR
$GUID_{GR2}$	GROUP ID OF THE RECEIVER
CPU_{GRADM}	GROUP ID OF THE ADMINISTRATOR'S CPU
CPU_{GRR}	GROUP ID OF THE RECEIVER'S CPU
TM_V	TIME SOFTWARE ACCESS IS VALID
DT_V	DATE SOFTWARE ACCESS IS VALID
TM_{ACT}	ACTUAL TIME
DT_{ACT}	ACTUAL DATE
$VESTING_D$	CASS DOMAIN FORM DEVELOPER
$VSDOM_{ADM}$	CASS DOMAIN FROM ADMINISTRATOR
HASH	*ADD APPROPRIATE HASH VALUES TO HEADERS (DONE WITH THE* MP EQUATION)
So,Sc	SESSION KEYS FOR ENCRYPTION AND AUTHENTICATION OF THE CONTENT OF THE MESSAGE
K_{A3}, K_{A4}	LONG-TERM ENCRYPTION AND AUTHENTICATION KEYS OF THE ADMINISTRATOR
K_{A5}, K_{A6}	LONG-TERM ENCRYPTION AND AUTHENTICATION KEYS OF THE RECEIVER
ACT	ACCESS CONTROL LIST CONTAINING PRIMARY EMAIL ADDRESSES OF RECIPIENTS

506

506

VARIABLES CAN BE DEFINED USING ANY PARTICULAR FIXED AND WELL COMMUNICATED METHOD

USERS TABLE

USERNAME	EMAIL	CUPUID	CLEARANCE	PASSWORD	BIOMETRIC
BOB	BOBE@A.C	5545	SECRET	BOB 123	F345A789
BILL	BILLE@B.C	11243	UNCLASSIFIED	BILL12328	E123C1
SAM	SAMAD@A	665446	TOP SECRET	SAM123	7788990A
JIM	JIME@I.CO	7777	SECRET	JIM23	123C2799

FIG. 8

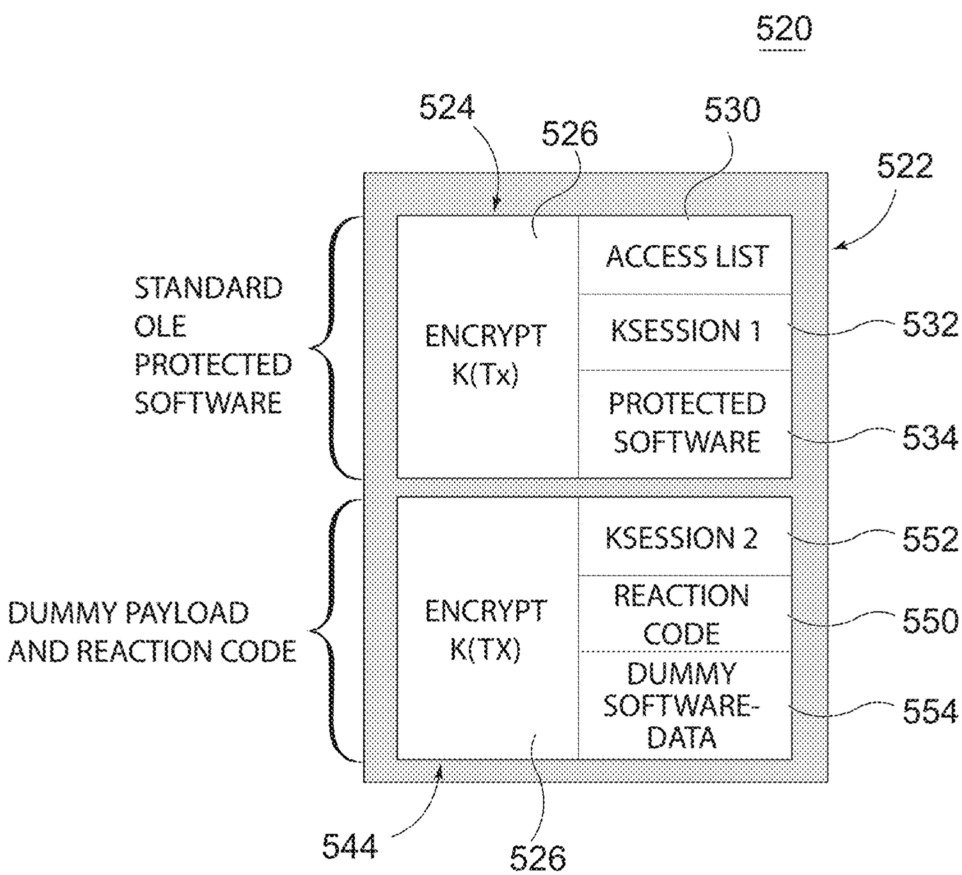
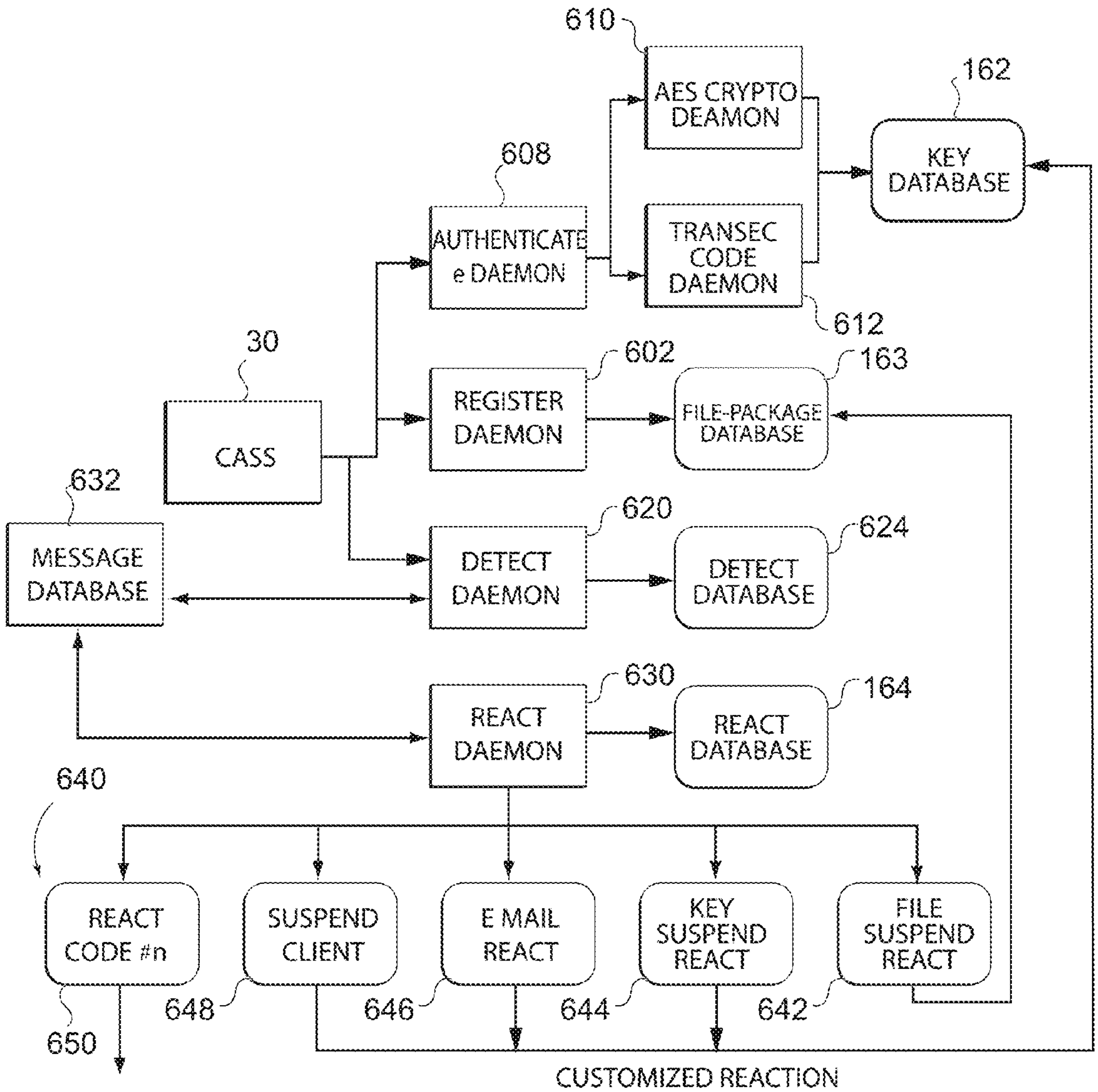
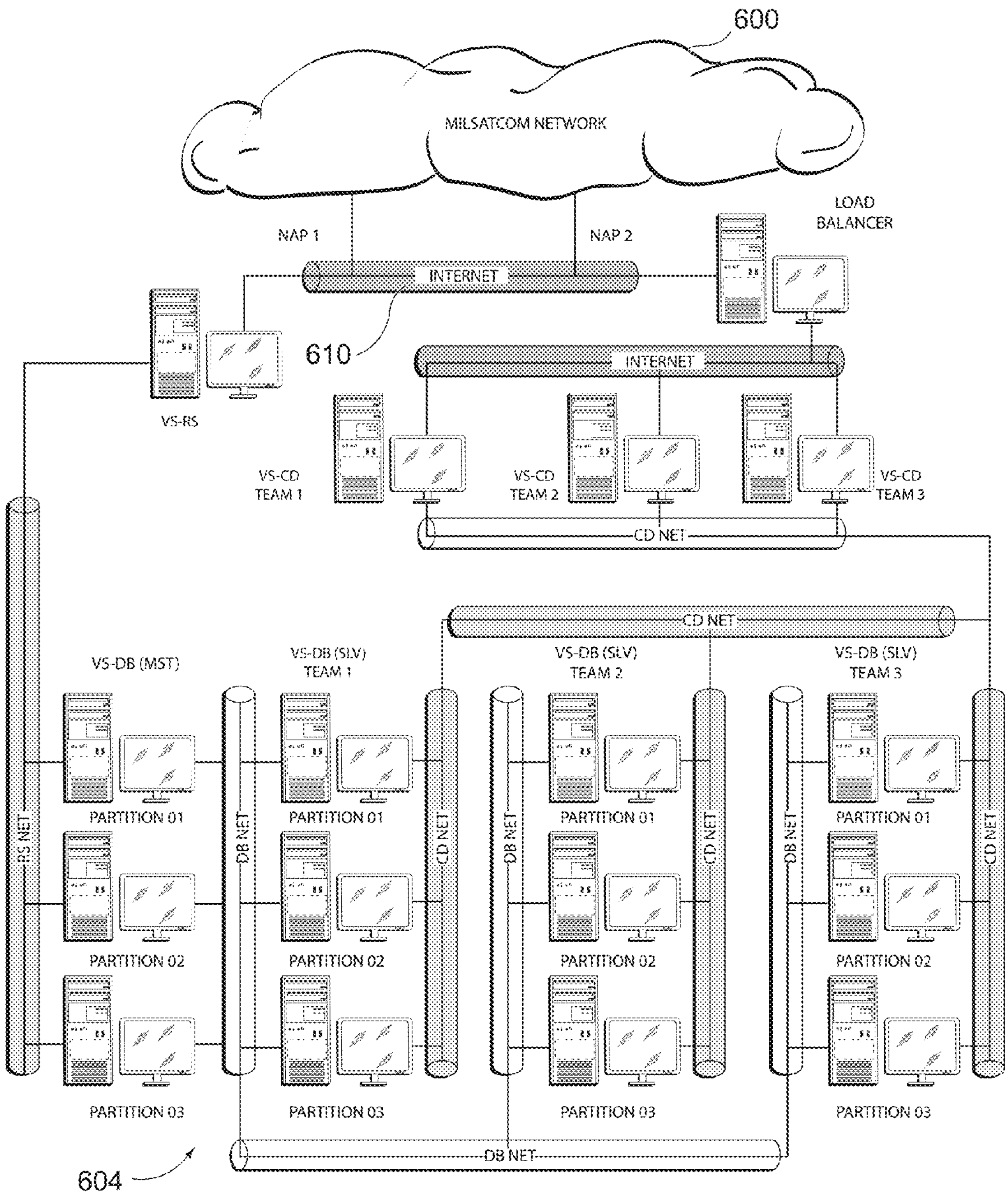

520
524
526
530
522
ACCESS LIST
STANDARD
OLE
PROTECTED
SOFTWARE
ENCRYPT
K(Tx)
KSESSION 1
532
PROTECTED
SOFTWARE
534
KSESSION 2
552
DUMMY PAYLOAD
AND REACTION CODE
ENCRYPT
K(TX)
REACTION
CODE
550
DUMMY
SOFTWARE-
DATA
554
544
526

FIG. 9



610
AES CRYPTO DEAMON
162
KEY DATABASE
608
AUTHENTICATE e DAEMON
TRANSEC CODE DAEMON
612
30
602
163
CASS
REGISTER DAEMON
FILE-PACKAGE DATABASE
632
620
624
MESSAGE DATABASE
DETECT DAEMON
DETECT DATABASE
630
164
REACT DAEMON
REACT DATABASE
640
REACT CODE #n
SUSPEND CLIENT
E MAIL REACT
KEY SUSPEND REACT
FILE SUSPEND REACT
650
648
646
644
642
CUSTOMIZED REACTION

FIG. 10



600
MILSATCOM NETWORK
NAP 1
NAP 2
LOAD BALANCER
INTERNET
610
INTERNET
VS-RS
VS-CD TEAM 1
VS-CD TEAM 2
VS-CD TEAM 3
CD NET
CD NET
VS-DB (MST)
VS-DB (SLV) TEAM 1
VS-DB (SLV) TEAM 2
VS-DB (SLV) TEAM 3
RS NET
DB NET
CD NET
PARTITION 01
PARTITION 02
PARTITION 03
DB NET
604

FIG. 11

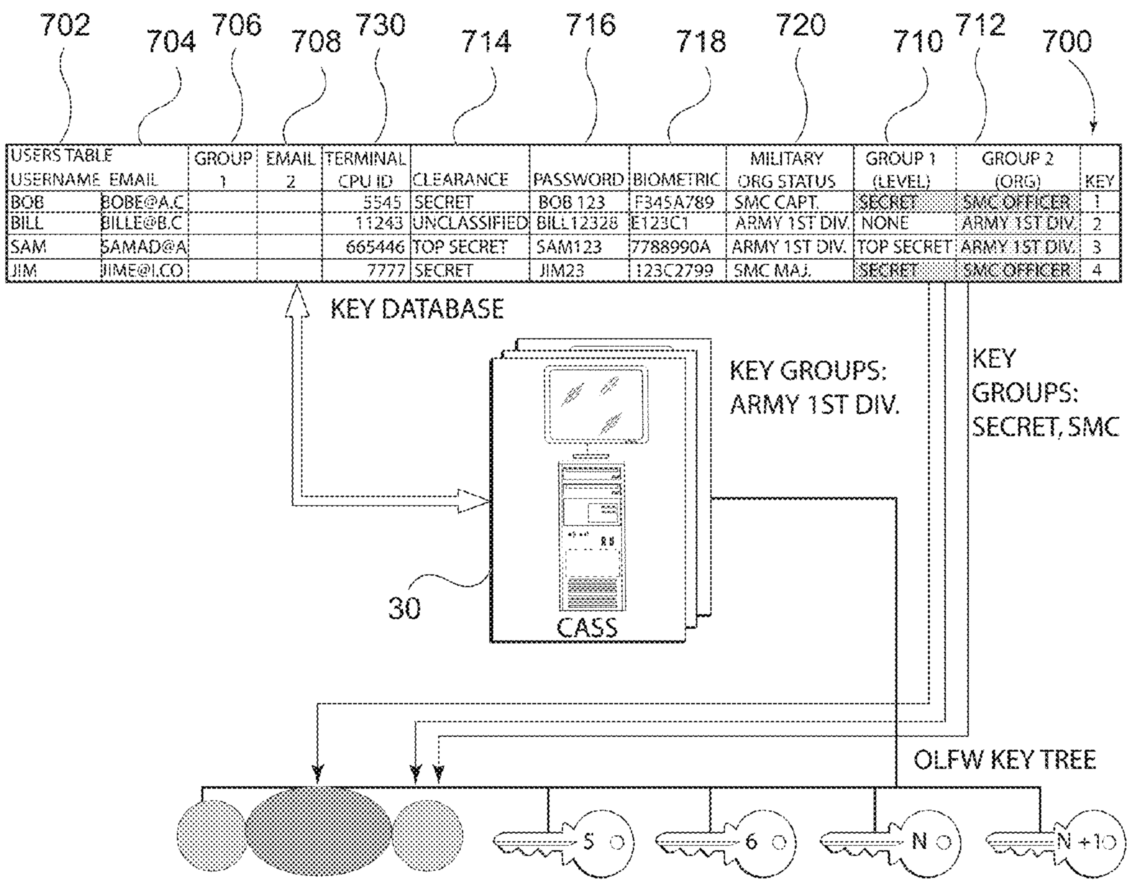
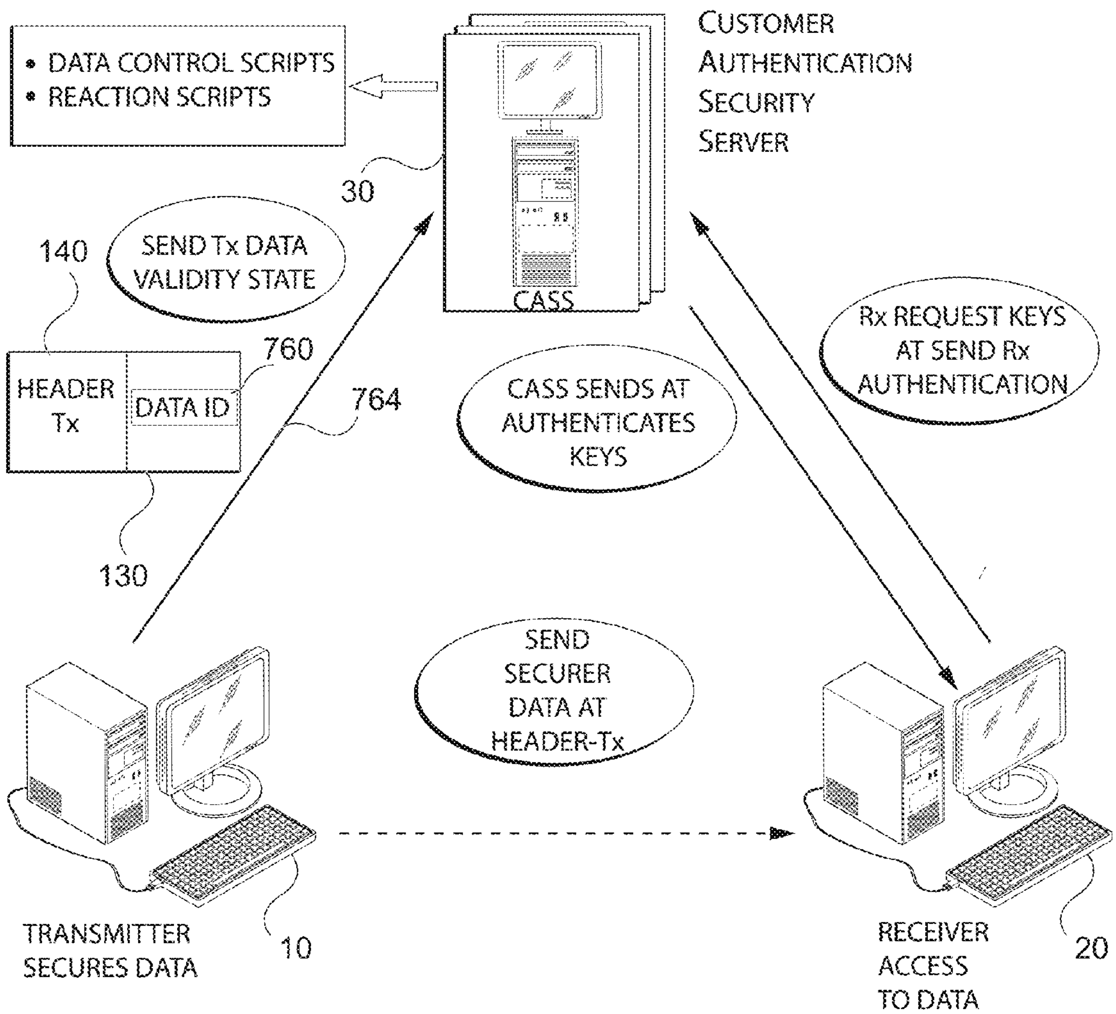

702
704
706
708
730
714
716
718
720
710
712
700
USERS TABLE
USERNAME EMAIL
GROUP 1
EMAIL 2
TERMINAL CPU ID
CLEARANCE
PASSWORD
BIOMETRIC
MILITARY ORG STATUS
GROUP 1 (LEVEL)
GROUP 2 (ORG)
KEY
BOB BOBE@A.C 5545 SECRET BOB 123 F345A789 SMC CAPT. SECRET SMC OFFICER 1
BILL BILLE@B.C 11243 UNCLASSIFIED BILL12328 E123C1 ARMY 1ST DIV. NONE ARMY 1ST DIV. 2
SAM SAMAD@A 665446 TOP SECRET SAM123 7788990A ARMY 1ST DIV. TOP SECRET ARMY 1ST DIV. 3
JIM JIME@I.CO 7777 SECRET JIM23 123C2799 SMC MAJ. SECRET SMC OFFICER 4
KEY DATABASE
KEY GROUPS: ARMY 1ST DIV.
KEY GROUPS: SECRET, SMC
30
CASS
OLFW KEY TREE
5
6
N
N+1

FIG. 12



DATA CONTROL SCRIPTS
REACTION SCRIPTS
CUSTOMER AUTHENTICATION SECURITY SERVER
30
CASS
140
SEND Tx DATA VALIDITY STATE
760
HEADER Tx
DATA ID
764
CASS SENDS AT AUTHENTICATES KEYS
Rx REQUEST KEYS AT SEND Rx AUTHENTICATION
130
SEND SECURER DATA AT HEADER-Tx
TRANSMITTER SECURES DATA
10
RECEIVER ACCESS TO DATA
20

FIG. 13

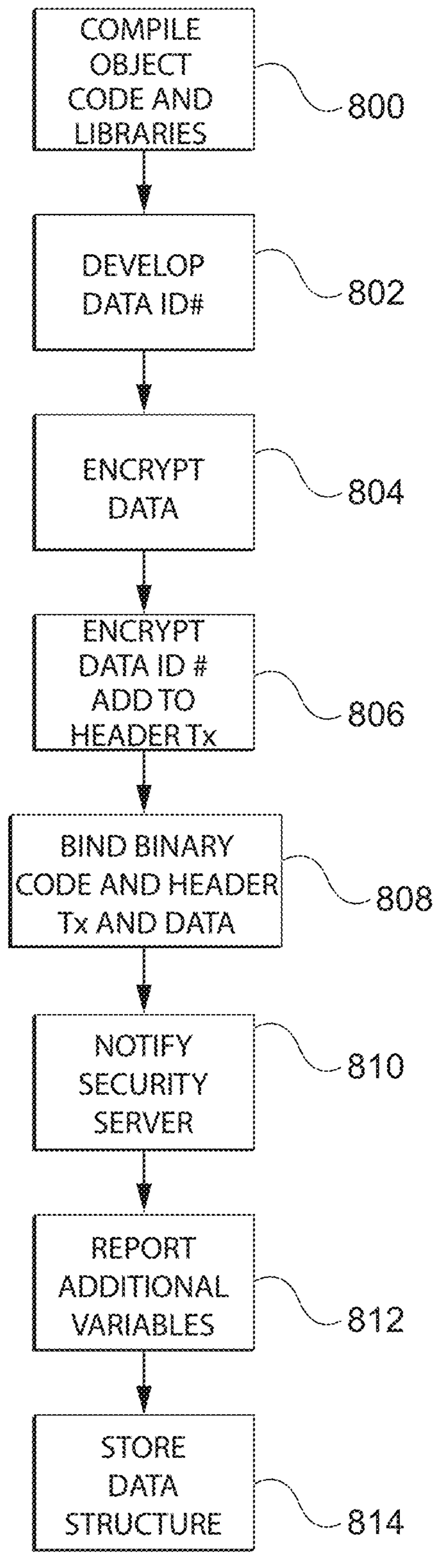
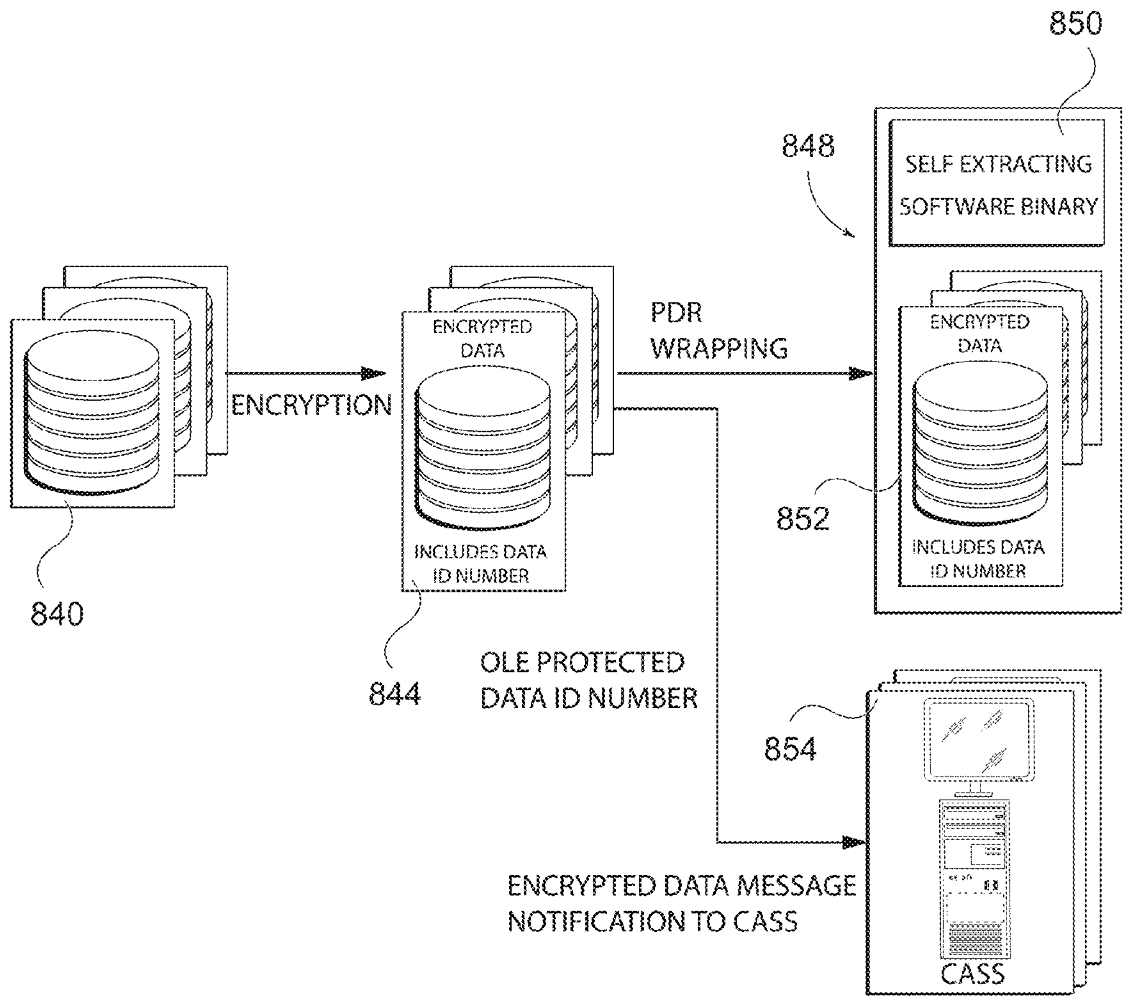

COMPILE OBJECT CODE AND LIBRARIES
800
DEVELOP DATA ID#
802
ENCRYPT DATA
804
ENCRYPT DATA ID # ADD TO HEADER Tx
806
BIND BINARY CODE AND HEADER Tx AND DATA
808
NOTIFY SECURITY SERVER
810
REPORT ADDITIONAL VARIABLES
812
STORE DATA STRUCTURE
814

FIG. 14



850
848
SELF EXTRACTING
SOFTWARE BINARY
ENCRYPTED
DATA
PDR
WRAPPING
ENCRYPTION
ENCRYPTED
DATA
INCLUDES DATA
ID NUMBER
852
ENCRYPTED
DATA
INCLUDES DATA
ID NUMBER
840
844
OLE PROTECTED
DATA ID NUMBER
854
ENCRYPTED DATA MESSAGE
NOTIFICATION TO CASS
CASS

FIG. 15

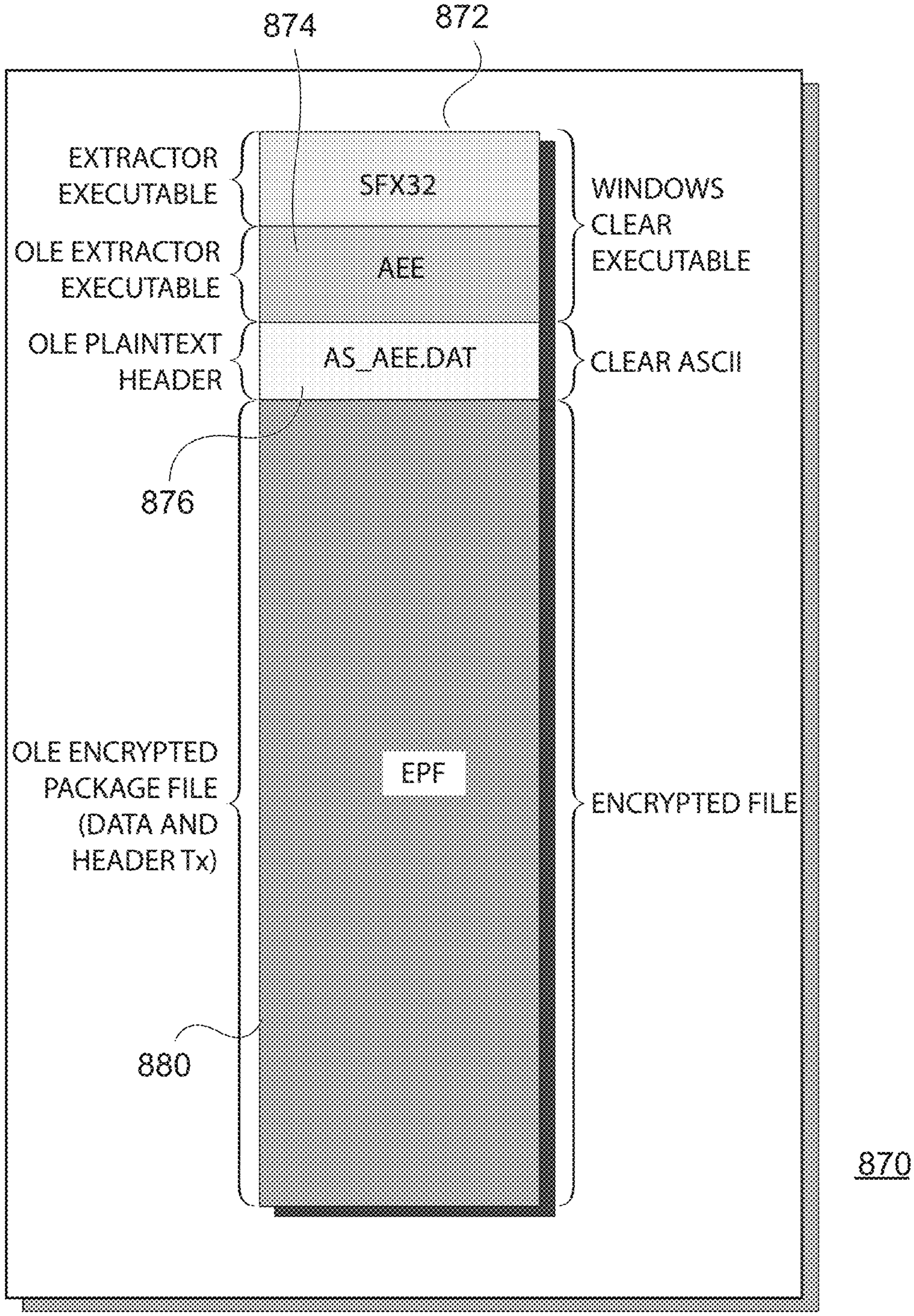

874
872
EXTRACTOR EXECUTABLE
SFX32
OLE EXTRACTOR EXECUTABLE
AEE
WINDOWS CLEAR EXECUTABLE
OLE PLAINTEXT HEADER
AS_AEE.DAT
CLEAR ASCII
876
OLE ENCRYPTED PACKAGE FILE (DATA AND HEADER Tx)
EPF
ENCRYPTED FILE
880
870

FIG. 16

900

PROTECTION VARIABLE (902)	LOCATION USED (904)	PLAINTEXT OR ENCRYPT (906)	ENCRYPTION KEY (908)	PROTECTION VALUE (910)
TRANSMITTER E-MAIL ADDRESS	HEADER-TX	PLAINTEXT	NA	ENCRYPTION KEY INDEX
TRANSMITTER E-MAIL ADDRESS	HEADER-TX	ENCRYPT	TRANSMITTER'S	TRANSMITTER AUTHENTICATION
TRANSMITTER PHONE NUMBER	HEADER-TX	PLAINTEXT	NA	ENCRYPTION KEY INDEX
TRANSMITTER IP ADDRESS	HEADER-TX	PLAINTEXT	NA	ENCRYPTION KEY INDEX
TRANSMITTER PUBLIC ID (OTHER TYPE)	HEADER-TX	PLAINTEXT	NA	ENCRYPTION KEY INDEX
TRANSMITTER PASSWORD	HEADER-TX	ENCRYPT	TRANSMITTER'S	TRANSMITTER AUTHENTICATION
TRANSMITTER BIOMETRIC	HEADER-TX	ENCRYPT	TRANSMITTER'S	TRANSMITTER AUTHENTICATION
ADMINISTRATOR E-MAIL ADDRESS	HEADER-TX	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
DATA TITLE	HEADER-Tx	ENCRYPT	TRANSMITTER'S	DATA AUTHENTICATION
DATA SERIAL NUMBER	HEADER-Tx	ENCRYPT	TRANSMITTER'S	DATA AUTHENTICATION
DATA AUTHOR	HEADER-Tx	ENCRYPT	TRANSMITTER'S	DATA AUTHENTICATION
DATA VERSION NUMBER	HEADER-Tx	ENCRYPY	TRANSMITTER'S	DATA AUTHENTICATION
RECEIVER E-MAIL ADDRESS	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
RECEIVER E-MAIL ADDRESS	HEADER-Rx	ENCRYPT	RECEIVER'S	RECEIVER AUTHENTICATION
RECEIVER E-MAIL ADDRESS	HEADER-Rx	PLAINTEXT	NA	ENCRYPTION KEY INDEX
RECEIVER PHONE NUMBER	HEADER-Tx	PLAINTEXT	NA	ENCRYPTION KEY INDEX
RECEIVER IP ADDRESS	HEADER-Tx	PLAINTEXT	NA	ENCRYPTION KEY INDEX
RECEIVER PUBLIC ID (OTHER TYPE)	HEADER-Tx	PLAINTEXT	NA	ENCRYPTION KEY INDEX
RECEIVER PASSWORD	HEADER-Rx	ENCRYPT	RECEIVER'S	RECEIVER AUTHENTICATION
RECEIVER BIOMETRIC	HEADER-Rx	ENCRYPT	RECEIVER'S	RECEIVER AUTHENTICATION
ADMINISTRATOR E-MAIL ADDRESS	HEADER-Rx	ENCRYPT	ADMIN'S	ADMINISTRATOR AUTHENTICATION
ADMINISTRATOR E-MAIL ADDRESS	HEADER-Rx	PLAINTEXT	NA	ENCRYPTION KEY INDEX
ADMINISTRATOR PASSWORD	HEADER-Rx	ENCRYPT	ADMIN'S	ADMINISTRATOR AUTHENTICATION
ADMINISTRATOR BIOMETRIC	HEADER-Rx	ENCRYPT	ANMIN'S	ADMINISTRATOR AUTHENTICATION
RECEIVER'S GROUP E-MAIL ADDRESS OR NAME	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
RECEIVER'S GROUP PROCESSOR ID OR IP ADDRESS	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
RECEIVER'S GROUP PUBLIC ID NAME	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
ADMIN'S GROUP E-MAIL ADDRESS OR NAME	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
ADMIN'S GROUP PROCESSOR ID OR IP ADDRESS	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
RECEIVER'S PROCESSOR ID OR IP ADDRESS	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
RECEIVER'S PROCESSOR ID OR IP ADDRESS	HEADER-Rx	ENCRYPT	RECEIVER'S	RECEIVER AUTHENTICATION
RECEIVER'S PROCESSOR ID OR IP ADDRESS	HEADER-Rx	ENCRYPT	PROCESSOR'S	RECEIVER PROCESSOR AUTHENTICATION
TRANSMITTER'S PROCESSOR ID OR IP ADDRESS	HEADER-Tx	ENCRYPT	TRANSMITTER'S	TRANSMITTER PROCESSOR AUTHENTICATION
ADMINISTRATION PROCESSOR ID OR IP ADDRESS	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS CONTROL LIST
ADMINSITRATION PROCESS ID OR IP ADDRESS	ADMIN HEADER	ENCRYPT	ADMIN'S	ADMIN PROCESSOR AUTHENTICATOIN
DATE/TIME SOFTWARE ACCESS OK	HEADER-Tx	ENCRYPT	TRANSMITTER'S	SECURE ACCESS TIME AVAILABLE
DATE/TIME OF REQUEST	HEADER-Rx	ENCRYPT	RECEIVER'S	SECURE ACCESSS TIME REQUESTED
DATA HASH (CHECKSUM)	HEADER-Tx	ENCRYPT	TRANSMITTER'S	DATA INTEGRITY VERFICATION
TRANSMITTER HEADER HASH (CHECKSUM)	HEADER-Tx	ENCRYPT	TRANSMITTER'S	HEADER INTEGRITY VERFICATION
ADMIN HEADER HASH (CHECKSUM)	HEADER-Tx	ENCRYPT	ADMIN'S	HEADER INTEGRITY VERFICATION
DATA HASH VALUE	HEADER-Tx	ENCRYPT	TRANSMITTER'S	DATA INTEGRITY VERFICATION
TRANSMITTER HEADER HASH VALUE	HEADER-Tx	ENCRYPT	TRANSMITTER'S	HEADER INTEGRITY VERFICATION
RECEIVER HEADER HASH VALUE	HEADER-Rx	ENCRYPT	RECEIVER'S	HEADER INTEGRITY VERFICATION
ADMIN HEADER HASH VALUE	ADMIN HEADER	ENCRYPT	ADMIN'S	HEADER INTEGRITY VERFICATION

FIG. 17

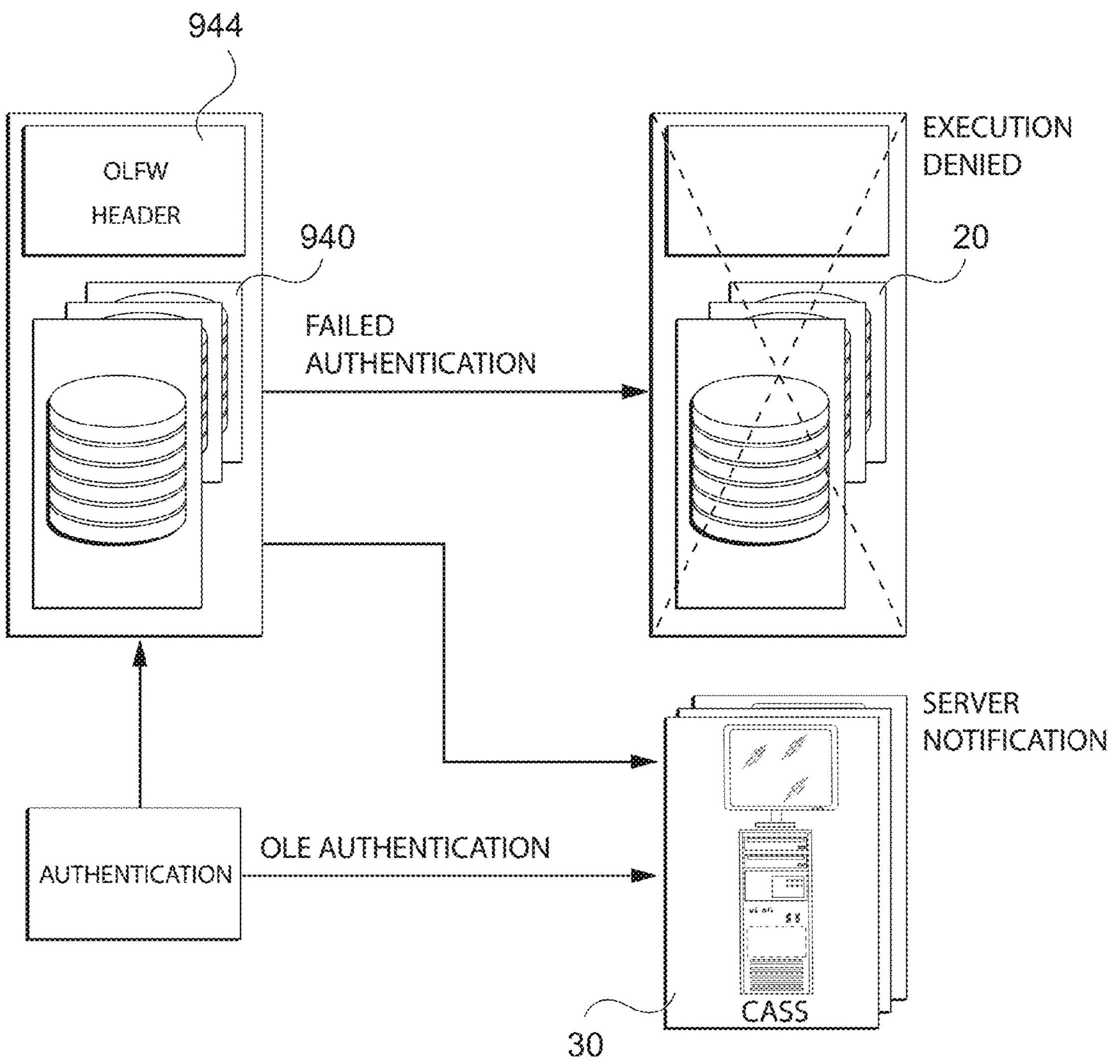

944
OLFW
HEADER
940
FAILED
AUTHENTICATION
EXECUTION
DENIED
20
SERVER
NOTIFICATION
AUTHENTICATION
OLE AUTHENTICATION
CASS
30

FIG. 18

1000

DETECTION CATEGORY (1002)	DETECTION VARIABLE (1030)	LOCATED IN (1040)	DOES NOT MATCH (1060)
1006 TRANSMITTER ERRORS	TRANSMITTER E-MAIL	SOURCE HEADER	DATA ID#
	TRANSMITTER E-MAIL	SOURCE HEADER	TRANSMITTER PASSWORD
	TRANSMITTER E-MAIL	SOURCE HEADER	TRANSMITTER BIOMETRIC
1008 ADMINISTRATOR ERRORS	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	DATA ID#
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN PASSWORD
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN BIOMETRIC
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN GROUP ID
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN'S E-MAIL
1010 RECEIVER ERRORS	RECEIVER'S E-MAIL	RECEIVER HEADER	DATA ID#
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER PASSWORD
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER BIOMITRIC
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER GROUP ID
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER GROUP ID
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER'S E-MAIL
1012 PROCESSOR	TRANSMITTER E-MAIL-ID	SOURCE HEADER	TRANSMITTER PROCESSOR ID
	RECEIVER'S E-MAIL-ID	SOURCE HEADER	RECEIVER PROCESSOR ID
	RECEIVER'S E-MAIL-ID	RECEIVER HEADER	RECEIVER PROCESSOR ID
	RECEIVER'S E-MAIL-ID	SOURCE HEADER	RECEIVER GROUP PROCESSOR ID
	RECEIVER'S E-MAIL-ID	RECEIVER HEADER	RECEIVER GROUP PROCESSOR ID
	ADMIN'S E-MAIL-ID	SOURCE HEADER	ADMIN PROCESSOR ID
	ADMIN'S E-MAIL-ID	ADMEN HEADER	ADMIN PROCESSOR ID
	ADMIN'S E-MAIL-ID	SOURCE HEADER	ADMIN GROUP PROCESSOR ID
	ADMIN'S E-MAIL-ID	ADMIN HEADER	ADMIN GROUP PROCESSOR ID
	ADMIN'S PROCESSOR ID	SOURCE HEADER	DATA ID#
	ADMIN'S PROCESSOR ID	ADMIN HEADER	DATA ID#
1014 ACCESS TIME	DATE/TIME OF REQUEST	ADMIN HEADER	DATE/TIME SOFTWARE ACCESS OK
	DATE/TIME OF REQUEST	RECEIVER HEADER	DATE/TIME SOFTWARE ACCESS OK
1016 SOFTWARE INTEGRITY	DATA HASH (CHECKSUM)	SOURCE HEADER	DATA HASH (CHECKSUM)
	DATA HASH (CHECKSUM)	ADMEN HEADER	DATA HASH (CHECKSUM)
1018 HEADER INTEGRITY	TRANSMITTER HEADER HASH (CHECKSUM)	SOURCE HEADER	TRANSMITTER HEADER HASH (CHECKSUM)
	ADMIN HEADER HASH (CHECKSUM)	ADMIN HEADER	ADMIN HEADER HASH (CHECKSUM)
	RECEIVER HEADER HASH VALUE	RECEIVER HEADER	RECEIVER HEADER HASH VALUE

DETECT: COMPONENT FAILURES
DETECT: SYSTEM FAILURES
DETECT: ATTACK BY MALICIOUS SOFTWARE
DETECT: SUSPICIOUS MODIFICATION OF FILES
DETECT: DISTINGUISH INTRUSION ATTACK FROM OUTSIDE VS. INSIDE
TIME STAMP AND MACHINE ID IN HEADERS SO CAN TRACK THEM
DETECT: SUSPICIOUS PATTERNS OF ACCESS ATTEMPTS

FIG. 19A

1070 1080

RESPONSE CATEGORY FROM LOCATION	ERROR CONDITION
DATA APPROVAL LIST	TRANSMITTER DOES NOT HAVE ACCESS TO THIS DATA
SOURCE HEADER	FALSE TRANSMITTER OR ACCESS ATTEMPT
SOURCE HEADER	FALSE TRANSMITTER OR ACCESS ATTEMPT
SOFTWARE APPROVAL LIST	ADMINISTRATOR DOES NOT HAVE ACCESS TO THIS DATA
ADMIN HEADER	FALSE ADMINISTRATOR OR ACCESS ATTEMPT
ADMIN HEADER	FALSE ADMINISTRATOR OR ACCESS ATTEMPT
SOURCE HEADER	ADMINISTRATOR DOES NOT HAVE ACCESS TO THIS SOFTWARE
SOURCE HEADER	FALSE ADMINISTRATOR OR ACCESS ATTEMPT
SOFTWARE APPROVAL LIST	RECEIVER DOSE NOTE HAVE ACCESS TO THIS DATA
RECEIVER HEADER	FALSE RECEIVER OR ACCESS ATTEMPT
RECEIVER HEADER	FALSE RECEIVER OR ACCESS ATTEMPT
SOURCE HEADER	RECEIVER DOES NOT HAVE ACCESS TO THIS SOFTWARE OR FALSE RECEIVER/ACCESS ATTEMPT
ADMIN HEADER	RECEIVER DOSE NOT HAVE ACCESS TO THIS SOFTWARE
SOURCE HEADER	FALSE RECEIVER OR ACCESS ATTEMPT
SOURCE HEADER	TRANSMITTER NOT USING CORRECT COMPUTER OR SOFTWARE ACCESS COMPROMISED
RECEIVER HEADER	RECEIVER NOT ON CORRECT COMPUTER OR FALSE RECEIVER
RECEIVER HEADER	RECEIVER NOT ON CORRECT COMPUTER OR FALSE RECEIVER
SOURCE HEADER	TRANSMITTER DOES NOT HAVE A CORRECT COMPUTER/GROUP ID LIST
RECEIVER HEADER	RECEIVER IS USING THE WRONG COMPUTER OR FALSE RECEIVER
SOURCE HEADER	TRANSMITTER DOES NOT HAVE CORRECT COMPUTER/GROUP ID LIST
ADMIN HEADER	ADMIN NOT ON CORRECT COMPUTER OR FALSE ADMINISTRATOR
SOURCE HEADER	TRANSMITTER DOES NOT HAVE CORRECT COMPUTER/GROUP ID LIST
ADMIN HEADER	ADMIN NOT ON CORRECT COMPUTER OR FALSE ADMINISTRATOR
SOURCE HEADER	TRANSMITTER DOES NOT HAVE CORRECT COMPUTER/ADMIN ID LIST
SOFTWARE APPROVAL LIST	ADMIN NOT ON CORRECT COMPUTER OR FALSE ADMINISTRATOR
SOURCE HEADER	ADMIN REQUESTING SOFTWARE OUTSIDE OF ACCEPTABLE TIME PERIOD
SOURCE HEADER	RECEIVER REQUESTING SOFTWARE OUTSIDE OF ACCEPTABLE TIME PERIOD
CLIENT UN-WRAPPER MODULE	DATA HAS BEEN TAMPERED
CLIENT UN-WRAPPER MODULE	DATA HAS BEEN TAMPERED
CASS Tx HASH CALCULATION	HEADER TAMPERING OR FALSE TRANSMITTER
CASS ADMIN HASH CALCULATION	HEADER TAMPERING OR FALSE ADMINISTRATOR
CASS Rx HASH CALCULATION	HEADER TAMPERING OR FALSE RECEIVER

1000

FIG. 19B

1002 1030 1040 1060

DETECTION CATEGORY	DETECTION VARIABLE	LOCATED IN	DOES NOT MATCH
1006 TRANSMITTER ERRORS	TRANSMITTER E-MAIL	SOURCE HEADER	DATA ID#
	TRANSMITTER E-MAIL	SOURCE HEADER	TRANSMITTER PASSWORD
	TRANSMITTER E-MAIL	SOURCE HEADER	TRANSMITTER BIOMETRIC
1008 ADMINISTRATOR ERRORS	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	DATA ID#
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN PASSWORD
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN BIOMETRIC
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN GROUP ID
	ADMINISTRATOR'S E-MAIL	ADMIN HEADER	ADMIN'S E-MAIL
1010 RECEIVER ERRORS	RECEIVER'S E-MAIL	RECEIVER HEADER	DATA ID#
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER PASSWORD
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER BIOMETRIC
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER GROUP ID
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER GROUP ID
	RECEIVER'S E-MAIL	RECEIVER HEADER	RECEIVER'S E-MAIL
1012 PROCESSOR	TRANSMITTER E-MAIL-ID	SOURCE HEADER	TRANSMITTER PROCESSOR ID
	RECEIVER'S E-MAIL-ID	SOURCE HEADER	RECEIVER PROCESSOR ID
	RECEIVER'S E-MAIL-ID	RECEIVER HEADER	RECEIVER PROCESSOR ID
	RECEIVER'S E-MAIL-ID	SOURCE HEADER	RECEIVER GROUP PROCESSOR ID
	RECEIVER'S E-MAIL-ID	RECEIVER HEADER	RECEIVER GROUP PROCESSOR ID
	ADMIN'S E-MAIL-ID	SOURCE HEADER	ADMIN PROCESSOR ID
	ADMIN'S E-MAIL-ID	ADMEN HEADER	ADMIN PROCESSOR ID
	ADMIN'S E-MAIL-ID	SOURCE HEADER	ADMIN GROUP PROCESSOR ID
	ADMIN'S E-MAIL-ID	ADMIN HEADER	ADMIN GROUP PROCESSOR ID
	ADMIN'S PROCESSOR ID	SOURCE HEADER	DATA ID#
	ADMIN'S PROCESSOR ID	ADMIN HEADER	DATA ID#
1014 ACCESS TIME	DATE/TIME OF REQUEST	ADMIN HEADER	DATE/TIME SOFTWARE ACCESS OK
	DATE/TIME OF REQUEST	RECEIVER HEADER	DATE/TIME SOFTWARE ACCESS OK
1016 SOFTWARE INTEGRITY	DATA HASH (CHECKSUM)	SOURCE HEADER	DATA HASH (CHECKSUM)
	DATA HASH (CHECKSUM)	ADMEN HEADER	DATA HASH (CHECKSUM)
1018 HEADER INTEGRITY	TRANSMITTER HEADER HASH (CHECKSUM)	SOURCE HEADER	TRANSMITTER HEADER HASH (CHECKSUM)
	ADMIN HEADER HASH (CHECKSUM)	ADMIN HEADER	ADMIN HEADER HASH (CHECKSUM)
	RECEIVER HEADER HASH VALUE	RECEIVER HEADER	RECEIVER HEADER HASH VALUE

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DETECT: SUSPICIOUS PATTERNS OF ACCESS ATTEMPTS

FIG. 20A

1110 1120 1130

REACTION "MILD"	REACTION "MID"	REACTION "SEVERE"
NOTIFY ADMIN	HALT TRANSMITTER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN OR TRANSMITTER	ALLOW 3 FAILED ATTEMPTS, THEN HALT TRANSMITTER'S ACCOUNT	FREEZE TRANSMITTER ACCOUNT
NOTIFY ADMIN OR TRANMITTER	ALLOW 3 FAILED ATTEMPTS, THEN HA T TRANSMITTER'S ACCOUNT	FREEZE TRANSMITTER ACCOUNT
NOTIFY SECOND ADMIN PERSON	FREEZE ADMIN'S ACCESS TO DATA	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY SECOND ADMIN PERSON	ALLOW 3 FAILED ATTEMPTS, THEN HALT ADMIN'S ACCOUNT	FREEZE ADMIN'S ACCOUNT
NOTIFY SECOND ADMIN PERSON	ALLOW 3 FAILED ATTEMPTS, THEN HALT ADMIN'S ACCOUNT	FREEZE ADMIN'S ACCOUNT
NOTIFY SECOND ADMIN PERSON	FREEZE ADMIN'S ACCESS TO DATA	FREEZE ADMIN'S ACCOUNT
NOTIFY SECOND ADMIN PERSON	FREEZE ADMIN'S ACCESS TO DATA	FREEZE ADMIN'S ACCOUNT
NOTIFY ADMIN	HALT RECEIVER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN OR RECEIVER	ALLOW 3 FAILED ATTEMPTS, THEN HALT RECEIVER'SACCOUNT	FREEZE RECEIVER ACCOUNT
NOTIFY ADMIN OR RECEIVER	ALLOW 3 FAILED ATTEMPTS, THEN HALT RECEIVER'S ACCOUNT	FREEZE RECEIVER ACCOUNT
NOTIFY ADMIN OR RECEIVER	HALT RECEIVER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN OR RECEIVER	HALT RECEIVER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN	FREEZE RECEIVER'S ACCESS TO DATA	FREEZE RECEIVER ACCOUNT
NOTIFY ADMIN OR TRANSMITTER	HALT TRANSMITTER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN OR RECEIVER	HALT RECEIVER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN OR RECEIVER	HALT RECEIVER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
PROVIDE ERROR MESSAGE	HALT TRANSMITTER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY ADMIN OR RECEIVER	HALT RECEIVER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
PROVIDE ERROR MESSAGE TO Tx	HALT TRANSMITTER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY SECOND ADMIN	FREEZE ADMIN'S ACCESS TO DATA	FREEZE ADMIN'S ACCOUNT
PROVIDE ERROR MESSAGE TO Tx	HALT TRANSMITTER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY SECOND ADMIN	FREEZE ADMIN'S ACCESS TO DATA	FREEZE ADMIN'S ACCOUNT
PROVIDE ERROR MESSAGE	HALT TRANSMITTER'S ACCOUNT	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY SECOND ADMIN	FREEZE ADMIN'S ACCESS TO DATA	FREEZE ADMIN'S ACCOUNT
PROVIDE ERROR MESSAGE	NOTIFY SECOND ADMIN	FREEZE DATA ACCESS TO ADMIN
PROVIDE ERROR MESSAGE	NOTIFY ADMIN	FREEZE DATA ACCESS TO RECEIVER
NOTIFY TRANSMITTER	NOTIFY ADMIN	FREEZE DATA ACCESS TO RECEIVER
NOTIFY TRANSMITTER	NOTIFY ADMIN	FREEZE DATA ACCESS TO RECEIVER
NOTIFY TRANSMITTER	NOTIFY ADMIN	FREEZE DATA ACCESS TO TRANSMITTER
NOTIFY ADMIN	NOTIFY SECOND ADMIN	FREEZE DATA ACCESS FOR ALL ACCOUNTS
NOTIFY RECEIVER	NOTIFY ADMIN	FREEZE DATA ACCESS TO RECEIVER

1100

FIG. 20B

OBJECT LEVEL ENCRYPTION SYSTEM INCLUDING ENCRYPTION KEY MANAGEMENT SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This patent application claims priority from Provisional Patent Application Ser. No. 61/908,580 entitled Encryption and Security Policy System, filed Nov. 25, 2013. The contents of this provisional patent application are fully incorporated herein by reference.

FIELD OF THE INVENTION

The present subject matter relates generally to security of data in motion and data at rest, and more particularly to a system which may perform encryption/decryption key registration, key distribution, authentication, and execution of a selectable response to success or failure of authentication.

BACKGROUND

Very widely used forms of encryption use a key to encrypt data prior to transmission. Another key is used by the recipient to decrypt the data. Encryption may be symmetrical in which the sender and receiver exchange a key. However, it is difficult to provide a safe, robust system due to the inherent difficulty of creating, transferring, managing, storing, authenticating, revoking encryption keys, and revoking access to encrypted data once the encrypted data has been distributed. The complexity is compounded as the number of users and access points increases.

Encryption keys must be distributed. In various systems, methods of registering encryption keys and client identity are provided. A means for distributing encryption keys to other clients is established. A common method is Pretty Good Privacy (PGP). In this method, clients log onto their public server and register their encryption keys. However, such a system is subject to registration of the key for a particular client by a non-authorized third party. This is referred to as a spoof.

Authentication of keys is essential. In order to prevent spoofs, a Certificate Authority (CA) creates a digital certificate which is used to establish the authenticity of an individual client or system. The CA is a trusted third party. The CA creates a digital certificate and digitally signs it using the CA's private key. The CA uses an industry standard, e.g., an X.509 certificate. This certificate comprises a data structure in a public key system to uniquely associate a particular entity with a particular public key. Such a system provides a reasonable level of protection. However, the certificate system is very difficult to manage and to administer.

Since the system is focused on uniquely associating one entity with one key, simple and easy methods for "grouping" of encryption keys are not available in order to allow more than two users to share encrypted data. Another desired capability is the ability to provide a different level of access to different ones of multiple users, i.e., multi-level security.

Existing systems do not provide for an action to take in response to unauthorized attempts at access to encrypted data. The systems are also limited in the proactive steps they can take in response to further unauthorized access attempts.

Various disadvantages in communications have been addressed in part. However, a solution has not been provided to address provision of a comprehensive system in encryption networks utilizing keys.

For example, United States Patent Application Publication No. 2014/0169567 discloses granting access to a plurality of devices to a local area network with a single cryptographic key. However, in use of the key, the key is converted from digital form to graphic form when being transferred to an operating device. This does not provide for condition-responsive changes to access the network.

United States Patent Application Publication No. 2014/0003608 discloses a system in which an administrator may generate key managers. Key request users may be linked to particular cryptographic keys. The cryptographic keys may be stored on key exchange servers separate from the key management server. Responsive to a request for a cryptographic key, the key exchange servers may authenticate the key request user associated with the request. However, means are not provided for changing a key in response to predefined circumstances.

United States Patent Application Publication No. 2013/0272524 discloses a system in which quantum keys are distributed to a plurality of parties for secure multi-party communications. The quantum key does not work seamlessly with encryption methods.

United States Patent Application Publication No. 2012/0300939 discloses authentic occasion by recognition of node identity. However, a system providing for interaction of other parameters with the node identity is not provided.

United States Patent Application Publication No. 2014/0315514 discloses a wireless device including a subscriber identity module. The subscriber identity module stores rules defining an acceptable set of behaviors for a wireless module. Action is taken to avoid cooperation with a wireless module that manifests aggressive behavior based on the rules. The wireless modem is blocked from generating traffic in the offending wireless network. However, no specific affirmative action is taken.

SUMMARY

Briefly stated, in accordance with the present subject matter, an apparatus, method, and a non-transitory programmed medium are provided in which a customer authentication security server (CASS) stores keys registered by a transmitting user and by a receiving user. Data to be sent is encrypted at the object level. A protocol and key management method allow a sender to identify a recipient and access an appropriate key using only publicly available information. A source generates a random symmetric session key and encrypts data at the object level with the key. The source selects a party, parties, or a particular group of parties that are authorized to have access to the encrypted data by specifying receiver IDs. Each receiver ID is a Public Identity Variable. Only public identity of a receiving party or group must be known. Receiver IDs can be created to define a group of recipients. In this manner, separate encrypted messages need not be sent to each group member. In order to register each key to correspond to its unique owner or group, the customer authentication security server receives and stores each party's key. Two or more parties are enabled to exchange and manipulate data without knowing the other party's encryption key.

The source selects a set of "Security Policy" variables which will be controlled. A set of data is added with a secured session key. A selected set of data is used to create a cryptographically secure "Header-Tx" with a secured session key and an Access Control List with an embedded security policy.

Data is sent to a receiver via the customer authentication security server. The server uses variables for authentication such as the network location of the recipient, GPS location, time of day, receiver passwords, receiver biometrics, messaging data document number, and other available identifiers. Attributes of identification and management of keys can be changed during use.

The customer authentication security server senses whether authentication succeeds or fails. The customer authentication security server can take positive actions beyond simply refusing access to the unauthenticated recipient. In the current system, each payload may include good data and dummy data. The system can select dummy data to be transmitted in response to unsuccessful authentication. In another form, the system can transmit and load spyware in order to locate the unauthenticated party.

BRIEF DESCRIPTION OF THE DRAWINGS

The present subject matter may be further understood by reference to the following description taken in connection with the following drawings:

FIG. **1** is a top-level block diagram of a system incorporating the present subject matter;

FIG. **2** is a block diagram of the system of FIG. **1** illustrating object level encryption details;

FIG. **3** is a diagram of the structure of a protected transmission;

FIG. **4** is a diagram illustrating loading of a transmitter's key and a receiving party's key to a relational database in a computer authentication security server;

FIG. **5** is a flowchart illustrating operation of a first embodiment;

FIG. **6** is a functional block diagram of the security server of FIGS. **1** and **2**;

FIG. **7** is a flowchart illustrating the software and method for authentication in the security server;

FIG. **8** is a chart illustrating exemplary parameters that may be included in authentication variables;

FIG. **9** is an illustration of a software structure suitable for use to respond to a failed authentication;

FIG. **10** is a block diagram of the architecture of the security server;

FIG. **11** is a block diagram of an embodiment of the security server particularly suited for high-volume applications;

FIG. **12** is a chart illustrating assignment of a client to a group, creation of client ID group associations, and grouping of keys in object level encryption;

FIG. **13** is a block diagram illustrating an option for controlling data after the data has been sent;

FIG. **14** is a flow chart illustrating an executable software program in which the Protect, Detect, and React (PDR) system is implemented.

FIG. **15** is a block diagram of a client wrapper module protecting and delivering secure data;

FIG. **16** is a chart illustrating an exemplary client wrapper module;

FIG. **17** is a chart illustrating exemplary object level encryption protection variables;

FIG. **18** is a diagram illustrating detection of an authentication failure;

FIGS. **19**A-**19**B is a chart illustrating exemplary object level encryption detection variables; and

FIGS. **20**A-**20**B is a chart illustrating exemplary object level reaction detection variables.

DETAILED DESCRIPTION

In accordance with the present subject matter, an apparatus, method, and non-transitory programmed medium are provided for encrypting and decrypting an object sent between two parties. The object is electronic data. Examples of objects include files, video streams, images, messages, e-mails, virtual private network (VPN) security keys, data streams, and VPN sessions. The objects may be sent and received by computers operating independently, computers operated by a user, smart phones, radios, or servers. The system utilizes object level encryption (OLE).

Encryption keys are transferred in order that an intended party can decrypt an object that was encrypted by a sending party. Each party has a unique secret encryption/decryption key. A key management method and system are provided in which the sender's and the recipient's key are stored in a security server. The sender may transmit data encrypted with the sender's key and identify the recipient only with publicly available information. The recipient's public identity can comprise one or more unique identifiers. Examples of unique identifiers are processors/hardware public serial number and name, Internet Protocol (IP) address, e-mail address, and telephone number. Public identities may also be used for groups. Two or more parties can transfer, store, or reject encrypted information without knowing the other party's encryption key.

FIG. **1** is a top-level block diagram of a system incorporating the present subject matter. A transmitter **10** sends an object package **15** to a receiver **20** over a link **16**. A party may comprise a user-operated computer, an attended or unattended computer, radio, server, smartphone, or other communications device. The object package **15** includes an object **13** as encrypted. The object **13** as encrypted is referred to as the encrypted object **14**. The object **13** is virtually any type of electronic data, for example, files, video streams, images, messages, e-mails, virtual private network (VPN) keys, data streams, and many other forms of intelligence. After the receiver **20**, has received the object package **15**, authentication is performed. Authentication is done in a customer authentication security server (CASS) referred to herein as security server **30**. The term CASS in the present invention is also used as an adjective to indicate things that interact with security server **30**. The receiver **20** sends a header **36** comprising identity information received from the transmitter **10** and identification of the receiver **20**. If authentication is successful, the security server **30** will provide a session key **38** to the receiver **20** for decrypting the encrypted object **14** to provide a decrypted object **17**.

The link **16** could comprise a local area network (LAN), a wide area network (WAN), or the Internet. The link **16** may take many forms including a publicly switched telephone network **52**. The link **16** could comprise a Wi-Fi system **62** having a transmitting antenna **64** and a receiving antenna **66**. Alternatively, the link could comprise the Internet **70**. This system can be used with time division multiplex access (TDMA), code division multiplex access (CDMA), or Global System for Mobile communications (GSM).

FIG. **2** is a block diagram of the system of FIG. **1** illustrating object level encryption details. The transmitter **10** comprises a processor **100**. An object **13** at a data location **110** is encrypted with a key from a key generator **112** to provide secure object data **114**. The secure object data **114** comprises the data **14**. This process is referred to as object level encryption. A transmitter ID, TxID, is stored in plaintext in a transmitter data structure **130** at a location **132**. In location **134**, a data package **136** is stored comprising a session key K(session) **138**, receiving party identification RxID, message security variables, and reaction response codes. Message security variables and reaction codes are discussed in detail below. This data package is encrypted with a transmitter key, KTx, to provide an encrypted transmission header, Header-Tx, **140**. The transmission header **140** also comprises an access control list (ACL). The transmission header **140** and the secure object data **114** are combined by transmission data interface circuit **144** to provide a protected transmission packet **148**. A data transfer unit **146** provides an output from the transmitter **10** for transfer to the receiver **20**.

The receiver **20** comprises a processor **160**. The processor **160** receives a protected transmission packet **148***a* from the data transfer unit **146**. The protected transmission packet **148***a* is separated into a Header Tx **140***a* and the secure object data **114***a*. The Header Tx **140***a* is stored for use in authentication. Authentication is performed as described with respect to FIG. 7 below. If authentication is successful, the key K(session) will be provided from location **174**. Decrypted data is provided to a data output module **176**. The suffix "a" denotes a data item as received by the receiver **20** corresponding to the data item as sent from the transmitter **10**.

The processor **160** creates its own header, Header Rx **190**. The Header Rx **190** is generated in a receiver header generation module **180**. A location **182** includes the identity, RxID, of the receiver **20** in plaintext. The RxID and receiver security policy variables at a location **184** (defined below) are encrypted with a receiver key K(Rx) at a location **186**. After receiving the encrypted data package **148***a* from the transmitter **10**, the receiver **20** requests authentication from the security server **30**.

To this end, the receiver **20** transmits Header Tx **140***a* and Header Rx **190** to the security server **30**. As illustrated and described in further detail below, the security server **30** comprises a hardware encrypted database **160**. The hardware encrypted database **160** looks up KTx and KRx, which have been provided to the database **160** as described with respect to FIG. **4**. The Header Tx **140***a* and the Header Rx **190** are compared. If authentication is successful, as described below, the security server **30** sends a data structure **192** including a data block **194** and a data block **196**. The data block **194** includes the session key K(session). Data block **194** comprises security policy and reaction responses. The data block **196** includes KRx. Data in block **194** is encrypted with KRx in block **196** to provide a session heading **198**.

FIG. **3** is a diagram of the structure of a protected transmission packet **148**. The protected transmission packet **148** is provided from the module **144** (FIG. **2**). The components of the protected transmission packet **148** are ordered in accordance with a selected communications protocol. Any order of components may be utilized so long as a compatible protocol is utilized.

FIG. **4** is a diagram illustrating loading of the transmitter **10**'s key and the receiver **20**'s key to the relational database **160** in the security server **30**. This operation is performed prior to transmission of data. Keys may be changed at users' options. First time individual secret symmetric key registration of each party can be made in a number of different ways. Keys can be created using a random number generator to create a random number which will comprise the key stored to software memory. Additional encryption details selected from a set of selectable encryption details such as in FIG. **8** below can also be registered.

FIG. **5** is a flowchart illustrating operation of a first embodiment utilizing standard symmetric encryption to transfer a basic session key between two parties. At block **200** an object **13** is loaded in a data location **110** (FIG. **2**). The object **13** could comprise a streaming signal, text, image, or any of a number of forms of intelligence. At block **202**, the object **13** is encrypted. At block **204**, the secure data object **114** is provided.

At block **210**, a data package is built. The initiation of block **200** and block **210** are both initiated in a time window such that the Header Tx **140** and the secure object data **114** can be combined and transmitted together. The data package comprises K(session), RxID, message security variables, and reaction codes. This data package is encrypted with the transmission key KTx. Additionally, the data package comprises the transmitter **10**'s ID in plaintext. At block **214**, the Header Tx **140** and the secure object data **114** are combined to form a transmission package **148** which is sent to the receiver **20**. At block **220** the transmission package **148** is sent to the receiver **20**.

Operation on transmission package **148***a* as received by the receiver **20** begins at block **230**. The transmission package **148***a* is divided. The header is stripped from the transmission package **148***a* to be used for authentication. The encrypted object from the secure object **114** is saved. Decryption is performed if authentication succeeds as further described below. Header Tx is sent to the security server **30** at block **232** Header Rx is sent to the security server **30** at block **234**. At block **236**, the public identities of the transmitter **10** and receiver **20** are identified and used to access the encryption keys that were loaded into the relational database **160**. The RxID from the Header Rx **190** and the RxID included in the Header-Tx **140***a* are provided for comparison at block **240**. Comparison may be made at block **242** between a selected plurality of identifying parameters discussed with respect to, for example, FIG. **8** below.

If authentication succeeds, i.e., if there is a match, operation proceeds to block **382** in FIG. **7**. In this manner, the receiver **20** receives a data package encrypted with its own key. The receiver **20** does not need to receive a key directly from the transmitter **10**. The encrypted object is decrypted as described with respect to FIG. **7**.

If authentication fails, operation proceeds to blocks **402** and **420** in FIG. **7**. The entire authentication process including reaction routine is described in detail with respect to FIG. **7** below.

FIG. **6** is a functional block diagram of the security server **30** of FIGS. **1** and **2**. Hardware may be implemented in integrated circuits. Particular components need not be discrete as illustrated in FIG. **6**. For authentication, the security server **30** uses an RxID register **302**, a comparator **306** and a key register **310**. Header Tx **140***a* includes the RxID as transmitted from the transmitter **10** in order to specify the desired receiver **20**. The RxID is transmitted from the Header Tx **140***a* to the RxID register **302**. The Header Rx **190** includes the actual RxID of the receiver **20**. Each of the RxIDs is transmitted to the comparator **306**. If the two RxIDs match, authentication has succeeded. A signal is provided to the key register **310**. The key register **310** provides the Key(session) to the receiver **20**. The Key (session) is used to decrypt the secure object data **114***a* and provide data to the data output **176** (FIG. **2**). If the two

RxIDs do not agree, the comparator **306** sends a failure signal to the receiver **20**, and a reaction routine further described below is initiated.

FIG. **7** is a flowchart illustrating the software and method for authentication in the security server. Authentication can be provided for a transacted piece of data. Alternatively, authentication can be provided for creation of a communications session. A session can be defined by the system for any selected duration of time. A system user will select a set of authentication variables. The selected variables can define both authentication requirements and a security policy. This capability is enabled by the object level encryption system. The security policy is passed through a combination of the added authentication variables and/or specific Message Security Policy Variables. In the OLE System, the Message Security Policy Variables are encrypted with the transmitter **10**'s key K(Tx). The key provides the security server **30** (FIG. **6**) with the proper variables for secure authentication of the receiver **20** and the receiver **20**'s security conditions. This Message Security Policy is encrypted and added as a header to the encrypted data. Security Policy variables can be selected through automated collection of data or can be entered by the clients.

At block **330**, the headers containing the RxIDs are sent to the RxID register **302** as described with respect to FIG. **6**. The system looks up KTx at block **332**. The Header Tx is encrypted at block **334**. Cryptographic add-ins may be added from block **336**. Additional data, e.g., signatures, may be added from block **340**. The decrypted Header data is stored at block **342**.

Similarly, the RxID is used to access KRx at block **350**. The Header Rx is decrypted at block **352** and stored at block **354**. The Header Rx includes a security policy in the form of selected parameters. The decrypted Header Tx data is provided to the comparator **306** (FIG. **6**) for comparison at block **360**. Similarly, the decrypted Header Rx is coupled for comparison at block **360**. Comparator criteria are loaded as indicated at block **362**. Additionally, Header Tx and Rx security policy variables are compared at block **370**. The RxIDs are evaluated at block **380**. If the RxIDs match, operation proceeds to block **382** and KRx is accessed. At block **384** K(session) is transmitted to the data module **170** (FIG. **2**). Data is decrypted at block **386** and provided to a client at block **388**.

At block **370**, security policy variables from each Header Rx and Header Tx are compared. If a match is found at block **400**, the process ends at block **402**. If the results do not match operation proceeds to block **404**. One option is to report to the transmitter **10** at block **406** and this process ends at block **408**. Alternatively, a mismatch can be determined at block **404** to end the session. Indications of a discrepancy are provided from the blocks **380** and **404**. At block **412**, a message is sent within the security server **30** which instructs security server **30** not to send K(session) to the receiver **20**. This process ends at block **414**. At block **420**, reaction codes are accessed in response to a disagreement as detected at block **380** or block **404**. At block **422**, reaction codes are decrypted and at block **424**, reaction steps are performed. The reaction routine is described below.

The OLE protocols enable the addition of authentication requirements to be added into the secure header. Common authentication variables include hardware ID, telephone number, e-mail address, IP address, personnel/client ID, time of day, security clearance level, location, and many others.

FIG. **8** is a chart **500** illustrating exemplary additional parameters that may be included in authentication variables. The chart **500** includes a first column **502** including variables. Each variable is listed in a row **506**. Column **504** is a description of the corresponding variable in the same row **506**. The chart below the text "variables can be defined " is shown in FIG. **12**.

The security server **30** preferably comprises one of a number of hardware architectures to make the security server "hack-proof." "Hack-proof" is a term describing a system that is more secure than comparable systems for comparable applications. "Hack-proof" is not a literal performance specification.

FIG. **9** is an illustration of a software structure suitable for use to respond to a failed authentication at either block **380** or **400** of FIG. **7**. This method is referred to as Protect-Detect-React. A transmitted data structure **520** includes a standard data block **524**. The standard data block includes encryption key KTx **526**. The fields provided for encryption include an access list **530**, key K(session**1**) **532**, and protected software **534**. The transmitted data structure **520** also includes a reaction data block **544**. The standard data block **524** includes encryption key KTx **526**. The fields provided for encryption include a reaction code **550**, key K(session**2**) **552**, and a dummy set of software and/or data **554**. If authentication fails, the reaction data block **544** is released. A number of different forms of reaction code could be issued. For example, reaction code could launch spyware which is transmitted in order to track the unauthenticated location.

FIG. **10** is a block diagram of the architecture of the security server **30**. The system of the security server **30** contains a plurality of functions built as daemons. A daemon is a program that runs continuously in the background and is ready to perform an operation in response to a service request. A register **602** allows users or administrators to register keys as well as serial numbers, passwords, time requirements, user groups, and other authentication variables which may be loaded into the relational database **162**. An authentication daemon **608** enables terminal source system computers to authenticate parties and transfer session encryption keys and TRANSEC Code variables. The authentication daemon **608** comprises an AES crypto daemon **610** and a TRANSEC Code daemon **612**. The daemons control movement of keys to the key database **162**. A detect daemon **620** provides lookup database queries and provides detection of failed authentication attempts at a detect database **624**. A react daemon **630** provides automatic actions in the case of authentication failure or failure to match security policy. A detected intrusion or failed authentication attempt, as signaled by the detect daemon **620**, accesses a react database **634**.

Preset reaction policies are illustrated in a row **640**. Reaction policies include a file suspend react **642** and a key suspend react **644**. An e-mail react **646** may be used to notify a system administrator of an authentication failure. A suspend client reaction policy **648** can suspend communication with a client that is not authenticated. A reaction code n **650** can specify particular actions to take in response to the react daemon **630**. N is an integer corresponding to a selected action.

The "Protect, Detect, and React" (PDR) method comprises additional capabilities. The OLE system inserts an active authentication server, the security server **30**, into the key management process. Protection is provided by the cryptographic encapsulation if the data and authentication vary. A number of additional protection elements are used during the transmitter encryption process. These include additional cryptographic treatment, cover, and/or randomization of data.

Detection is achieved when a variable is missing, incomplete, or discrepant from a correct receiver's identity. An incorrect receiver's identity is one that is not on the Access Control List (FIG. **2**) or that does not match a message Security Code. An unauthorized party may attempt to ping the security server **30** in an attempt to learn keys, codes, or algorithms. The unauthorized party may be trying to use a stolen computer or smartphone. The security server **30** will respond to this fault because the headers are uniquely encrypted communications bundles that are impossible to generate without every item in place at a first time.

Reaction comprises launching of an active countermeasure from the security server **30**. The active countermeasure is in the security server **30** database system or in the receiver's processor software. The security server **30** will, when the option is selected, notify administrators of faults based on a security policy comprising variables included in the header. The OLE system utilizes the requester's individual secret key. In the case of a failure to authenticate, only one key needs to be revoked. However, other members in an OLE group will remain valid.

FIG. **11** is a block diagram of an embodiment of the security server **30** particularly suited for high-volume applications. The CASS server system can be scaled to accommodate a very high volume of users, for example volumes of users on such websites as www.Google.com. Connectivity is provided via common techniques such as an IP network, phone system network, or LAN network. In FIG. **11**, a military satellite communications network (MILSATCOM NETWORK) **600** is coupled to a network **604** by the Internet **610**. FIG. **11** is an example of a distributed or very large security server **30**. "Very large" could mean having the capability of handling millions of interchanges per day.

FIG. **12** is a chart **700** illustrating assignment of a client to a group in object level encryption. In embodiments comprising the arrangement of FIG. **12**, a group of clients is authenticated as a single client. Grouping keys are produced by creating a group public ID. Names of individual clients are listed in column **702**. In column **704**, individual clients are identified by e-mail address. Columns **706** and **708** identify first and second groups and define the group to which a client in column **704** is assigned. The relational database **162** (FIG. **2**) may use MySQL for Oracle SQL, for example. Group associations are used by the OLE protocol to provide access to groups such as those identified in columns **706** and **708** and to the clients respectively assigned to each group.

A spreadsheet representation of a database can be built into a larger SQL database and used to authenticate or deny Headers based on meeting group accept/reject criteria. Further attributes are selected to define the Security Policy of this embodiment. A column **710**, entitled Group **1**, lists levels of security clearance each defining one group. Classification levels include unclassified or none, secret, and top secret. Column **712**, entitled Group **2**, lists clients by organization. A column **714** lists security clearance level of each client. In the present illustration, the attribute is classification level.

In the present embodiment, further attributes that have been selected include password in column **716**, biometric ID in column **718**, and military organization status in column **720**.

Because the data above are included in the relational database **162** (FIG. **1**), public and private identity variables and group associations are effectively cross referenced along with group associations. The key database combined with the OLE authentication protocol can then be used to allow/deny access to encrypted data based on the Group Association(s). One individual or hardware terminal may be easily removed from a Group by making authorized changes to the database.

CASS provides authentication, session key transfer, and key registration. CASS is a database using an OLFW protocol and provides normal database functions. Normal database functions include add/delete authorization, track transactions, and implement policy. The reaction methods are implemented with scripts executing policy. These methods include denial of authorization, revocation of keys, halting specific software access, sending e-mail to administrative personnel, and sending a "self-destruct" signal to a Client Wrapper Module (FIGS. **15** and **16**).

FIG. **13** is a block diagram illustrating an embodiment in which access to a unique data package can be controlled even after the package is delivered to the receiver **20**. In this embodiment, a Data ID number **760** is added into the data structure **130** for inclusion into the Header Tx **140** as a Security Policy Variable. This enables implementation of control of individual data packages directly from the transmitter **10** or by a trusted administrator having access to the data structure **130**. The Data ID number is stored by the transmitter **10** for later use. Once a data package is determined to be deemed to be revoked, the transmitter **10** can send an OLE cryptographically secure message to CASS with the Data ID number **760** and a code to revoke the message. CASS can then store this data control "command" and reject authentication anytime that individual data package is requested to be authenticated.

Operation proceeds as in FIG. **2**. However, the object level encryption protocol is modified to include the additional data ID number **760**. The Data ID number **760** is an additional parameter that must be looked up. Once the Data ID number **760** is looked up, it is compared to a CASS Message List to determine if the particular message has been commanded to be revoked. If not revoked, the key K(session) is sent as in FIG. **2**. If the authorization for the message has been revoked, then non-authentication is indicated. The key is not sent. A reaction routine may be initiated.

The OLE process/protocol is modified and an additional communication link step is provided between the transmitter **10** and the security server **30**. This additional operation is shown by arrow **764** in FIG. **13**. The authentication comparison will determine if the message is still "valid" based on the inclusion of the Data ID number. The Data ID number can be added at any time after the initial data structure **130** was created. The Data ID can be used for security server **30** notification of a request for decryption of secure data. If the Data ID number has not been revoked and all other OLE authentication steps were determined to be acceptable, the session key K(session) is authorized and sent using the standard OLE process.

Control of the data can be augmented by using a client hardware/software application design that only acts as a "viewer" to the receiver client and does not allow the decrypted data to be stored after decryption. In this application of OLE, the receiver client only is able to display the data; when the application or file is closed it returns to its OLE encrypted state.

FIG. **14** is a flow chart illustrating an executable software program in which the Protect, Detect, and React (PDR) system is implemented. The OLE technology can be used to develop a PDR system comprised of an encrypted data package and an associated authentication/delivery system. The embodiments above relate to an apparatus, method, and non-transitory programmed medium to protect data with an embedded Access Control List for one or more users. Additionally, Detection and Reaction Criteria are specified.

The embodiment of FIG. **14** provides implementation of the PDR system in an executable software program. The executable program may be run within the transmitter **10**.

The program begins at block **800** in which source code is used to compile self-extracting software binary code with applicable supporting data and libraries. At block **802**, data identifier number, e.g., the Data ID number **760**, is developed and delivered to the data structure **130**. At block **804**, encryption is performed to encrypt the data, nominally the ACL, session key, and security policy as described with respect to FIG. **2**. The public ID, Tx ID is added. The Data ID number **760** is encrypted and added into the Header Tx **140** at block **806**.

At block **808**, the self-extracting software binary code with encrypted data and entire Header Tx are bound in an appropriate package to be executed on the receiver **20**'s computing platform. (Example: *.exe file for DOS/Windows operating systems, launch with double-click, etc.). When validation succeeds, the OLE protected communication method notifies the security server **30** and the receiver **20** at block **810**.

At block **812** variables can be sent to the security server **30** to be stored by CASS for future authentication purposes. The variables may include TxID, Data ID number, authorized clients (Access Control List), authorized processors (Processor ID List), applicable security policy, and reaction policies to follow if authentication fails. At block **814** the resulting file (data structure) is then stored and/or transmitted for any number of future uses by receivers.

FIG. **15** is a block diagram of executables that are created and performed in the process of FIG. **14**. A compiler executable **840** comprises compiled object code along with supporting data and libraries. This module performs encryption and leads to production of encrypted data in an encryption executable **844**. The OLE protocol is performed. Encrypted data is sent via PDR wrapping to data extraction executable **848**. The data extraction executable **848** includes a self-extracting binary code module **850** and contains encrypted data **852** including the Data ID number. The encrypted data executable **844** is also followed by an encrypted data notification **854** to the security server **30**.

FIG. **16** is a chart illustrating an exemplary client wrapper module file structure **870**. The file structure **870** includes an extractor executable **872**, and an OLE executable **874**. OLE plaintext header **876** is preferably provided in clear ASCII. An OLE encrypted package file **880** includes data and Header-TX.

FIG. **17** is a chart **900** illustrating exemplary object level encryption protection variables. Column **902** lists names of protection variables that may be used in a security policy. Examples include transmitter IP address, data title, receiver IP address and other identifiers with respect to the transmitter, receiver, and the data itself. Column **904** specifies the Header in which the respective value is included. Specification of plaintext or encryption is listed in column **906**. Column **908** identifies the encryption key associated with each variable. A protection value associated with each variable is listed in column **910**. The protection value relates to the data entity which is being protected.

FIG. **18** is a diagram illustrating detection of an authentication failure in the software-operated embodiment. Authentication is performed at an authentication module **940**. Failure of authentication is reported to the security server **30** and to an OLFW Header **944**. The failed authentication is reported by the Header **944** to the server to instruct the receiver **20** to deny execution of decryption. At the same time, the security server **30** is notified that the denial of execution has been issued.

FIGS. **19A-19**B is a chart **1000** illustrating exemplary object level encryption detection variables. OLE detection variables are used to define forms of a Security and Authentication Policy. Names of variables that may be used in a security policy include transmitter IP address, data title, receiver IP address and other identifiers with respect to the transmitter, receiver, and the data itself.

Column **1002** lists categories of detection. These categories may include transmitter errors **1006**, administrator errors **1008**, receiver errors **1010**, processor errors **1012**, access time of day errors **1014**, data integrity errors **1016**, and header integrity errors **1018**. Note that an endless number of different reactions can be developed.

Column **1030** lists the detection variable or variables within each category of errors. Column **1040** specifies the header in which the respective value is included. In column **1060**, different types of data within each detection category that are used for comparison in authentication are listed. For example, within detection category **1006**, transmission errors, parameters for which a match is needed in authentication include Data ID number, transmitter password, and transmitter biometric. Column **1070** lists the location of each identified variable. Column **1080** lists an error condition corresponding to each instance of a failure to match within the authentication process.

Reaction by the CASS server takes place substantially simultaneously with failed detection. A series of automated software scripts can be written into CASS and/or the secured OLE Header Tx and/or into the receiver client software that are then initiated by CASS. CASS can directly run its own software reaction code, as seen in FIGS. **20**A-**20**B below. CASS can also signal the receiver **10** with OLE secured Reaction Codes to initiate software embedded into the CWM **870** (FIG. **16**) and/or the OLE Header-Tx. The Reaction Codes can also initiate software directly in client operating system/application software.

FIGS. **20**A-**20**B is a chart **1100** illustrating exemplary "Reaction Variables" and different degrees of response that may be selected in response to each form of detection of failure of authentication. In all cases, the session key K(session) is not provided and access to data is denied. In FIG. **20** the detection variable examples are the same as those of FIGS. **19**A-**19**B, and the same reference numerals are used to denote the same columns. A level of reaction to each error condition can be defined. Column **1110** describes "mild" reactions to failure of authorization. Column **1120** describes "mid" reactions to failure of authorization, and column **1130** describes "severe" reactions to each failure of authorization.

For example, one receiver error in the category **1010** and column **1060** denotes a detection of a discrepancy in receiver passwords. In column **1080** the error condition is identified as a receiver not having access to the data it is seeking. Different levels of reaction are listed in columns **1110**, **1120**, and **1130**. The "mild" reaction in column **1110** is to notify an administrator or the receiver **10** seeking access. A "mid" reaction is to allow three failed attempts and then halt the receiver's account. A "severe" reaction as seen in column **1130** is to freeze the receiver's account after one incorrect password entry.

Column **1102** lists categories of detection. These categories may include transmitter errors **1106**, administrator errors **1108**, receiver errors **1110**, processor errors **1112**, access time of day errors **1114**, data integrity errors **1116**, and header integrity errors **1118**. Note that an endless number of different reactions can be developed, these are simply a single set. Column **902** lists names of variables that may be used in a security policy. Examples include transmitter IP address, data title, receiver IP address, and other identifiers with respect to the transmitter, receiver, and the data itself. Column **904** specifies the header in which the respective value is included. Specification of plaintext or encryption is listed in column **906**. Column **908** identifies the encryption key associated with each variable. A protection value associated with each variable is listed in column **910**. The protection value relates to the data entity which is being protected in connection with the use of the protection value.

The OLE technology can be implemented into a number of different system types, providing encrypted security for different classes of data in respective applications. Examples of system types include computer, cell phone, or modem. Examples of data and systems include, but are not limited to, encrypted data streams (data in motion), encrypted files (data at rest), secure microprocessors in which the software is encrypted uniquely for each microprocessor and decrypted only inside the microprocessor, encrypted e-mail messages and/or their attachments, encrypted relational database fields, encrypted ad-hoc wireless networks, encryption co-processor chips, encrypted text messages and/or their attachments, encrypted video files, and encrypted web browsers.

An OLE implementation in the CASS authentication system provides many security capabilities. Encrypted data and software in motion can be provided to internal portions of the hardware processor.

An individualized encryption key can be provided for each hardware unit. A security policy may be defined by providing additional authentication variables for each hardware unit. These include processor, computer, phone or modem ID, time of day, personal identity of a user, and the physical location of a user.

Individualized encryption keys may be provided for all users. Individualization may be provided by specifying additional authentication variables for each hardware unit, such as processor, terminal or modem ID, controlled time of usage, controlled hardware usage, or controlled location allowed for usage.

The OLE system has the capability to secure voice, video, or data such as text messages, e-mails, digital files of any type including, communication streams in which data becomes a session key that is used to set up a Virtual Private Network (VPN) session, software and/or firmware into hardware processing platforms, and attachments to any message type.

Capability is provided to group personnel or processors into working groups, tied together with a CASS database management. Removal and addition of personnel/processors is achieved without re-encrypting and distributing data.

Grouped data can be provided. Where the data is secured once for the selected ACL group(s) into a single file or multi-cast, it can be copied to any group member. Each accepted member of the group can be allowed access using the individual client(s) to group association(s) to accept/reject access to the data through control of the session key.

The system may include Detect-Protect-React capability to respond to encryption tampering events. Reactions may include removal of hardware from access to data, removal of personnel (individual clients) from access to data, deletion of encrypted data, providing decryption of a dummy payload, allowing the adversary to think they have cracked the system, and tracking of adversaries with spyware.

Revoking access to secured data can be triggered by notifying CASS that an individual message is to be revoked even after it has been sent.

Security policy is defined by preselected variables embedded into encrypted data as parameters used in authentication. Additional variables can be added later. The CASS system can store standard database reports of authentications, detection of errors, detection of unauthorized access attempts, and automatic policy actions.

I claim:

1. A method for providing key exchange in a communications network using a symmetrical encryption algorithm key, comprising:

a. providing a transmitter having a selected transmission key KTx;
b. generating at the transmitter a random symmetric session key K(session);
c. encrypting a data object with the session key K(session) to provide protected data;
d. selecting at the transmitter a desired RxID corresponding to an authorized receiver;
e. establishing RxID as a public identity variable;
f. selecting message security policy variables;
g. providing a data structure comprising the desired RxID, the message security policy variables, and session key;
h. encrypting the data structure with the transmitter key to provide an encrypted data structure;
i. adding to the encrypted data structure a public ID of the transmitter in plaintext to provide a transmission package including a Header-Tx comprising the desired RxID;
j. sending the transmission package to a receiver;
k. providing a data structure Header-Rx including an actual RxID identifying the receiver;
l encrypting Header-Rx with a receiver key KRx;
m. storing KRx and KTx at a security server;
n. sending Header-Tx and Header-Rx to the security server,
o. selecting KTx as stored at the security server and using KTx to decrypt Header-Tx and accessing desired RxID;
p. comparing desired RxID to actual RxID;
q. registering successful authentication if the desired RxID and the actual RxID match;
r. in response to successful authentication sending session key K(session) to the receiver; and
s. decrypting the protected data at the receiver using K(session).

2. A method for secure network communication comprising:

providing a first encryption key KTx and a second encryption key KRx for a transmitter and a receiver respectively;

storing a copy of the first encryption key KTx and a copy of the second encryption key KRx in an encrypted database in a server, placing each copy in a location accessible by an address corresponding to an identity of a respective transmitter or receiver;

forming in the transmitter a data structure comprising a header in which a session encryption key K (session), receiver ID, and security information are encrypted by KTx and a secured data object in which data is encrypted with K (session);

forming a transmitted packet comprising the header and the secure data object;

transmitting the transmitted packet to a receiver;

forming in the receiver a receiver transmitter header and a received secure object data;

forming in the receiver a receiver header comprising a header in which a session encryption key K (session), receiver ID, and security information are encrypted by KRx and a receiver secured data object in which data is encrypted with K (session);

comparing the receiver header and the received transmitter header and producing a signal indicative of authentication or failure of authentication, failure comprising determining that a variable is missing, incomplete, or discrepant from a correct receiver's identity; and

in response to a signal indicative of authentication, accessing the receiver key KRx from the encrypted hardware memory, to permit use of K (session) to decrypt the receiver secure data object.

3. A method according to claim **2** wherein the security information comprises message security variables and reaction response codes and further comprising the step of accessing a reaction response code in response to a signal indicative of failure of authentication.

4. A method according to claim **3** wherein the step of providing reaction response codes comprises providing selectable commands each corresponding to a level of response to the failure of authentication.

5. A method according to claim **3** wherein the step of providing reaction response codes comprises providing commands indicative of respective selectable actions.

6. A method according to claim **4** wherein the step of providing reaction response codes further comprises providing commands indicative of respective selectable actions and wherein one said action comprises transmitting data other than the secured data to a transmitter providing incorrect authentication information.

7. A method according to claim **6** comprising assigning a group of clients for authentication as a single entity.

8. A method for secure network communications utilizing object level encryption comprising:

encrypting data at a transmitter with a session encryption key to provide secure object data;

providing a transmitter header comprising a combination of the session encryption key, identity of a target receiver, and message security variables all encrypted with a transmitter encryption key;

forming a packet comprising the header and the secure object data;

transmitting the packet to the target receiver;

creating at the receiver a received transmitter header indicative of the transmitted header and a received transmitter secure object data;

providing at the target receiver a receiver heading comprising receiver identity and receiver security variables encrypted with a receiver encryption key;

verifying correspondence of security variables in said received transmitter heading and said receiver transmitter heading;

in response to verification, utilizing the receiver identity provided in the transmitter header to access a stored receiver encryption key; and

providing the receiver encryption key for use by the receiver for decrypting the received secure data.

9. A method according to claim **8** wherein the step of providing the receiver encryption key for decrypting received secure data comprises accessing the receiver security key and utilizing the receiver encryption key to decrypt a data structure comprising the session security key and security variables, and decrypting the received transmitter secure object data.

10. A method according to claim **9** further comprising providing reaction codes and accessing a reaction code in response to the failure of authentication.

11. A method according to claim **10** further comprising controlling a data package after the data package has been delivered to a receiver by assigning a data ID number to the transmitter header, associating a code with the data ID number, sending a command from the transmitter to the server to revoke the message and storing the command at the server to command failure of authentication in response to a request to authenticate a data package corresponding to the data ID number.

12. A method according to claim **11** wherein security codes comprise selective variables indicative of values and names of parameters associated with the transmitter.

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